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# 1987

## Census of Manufactures

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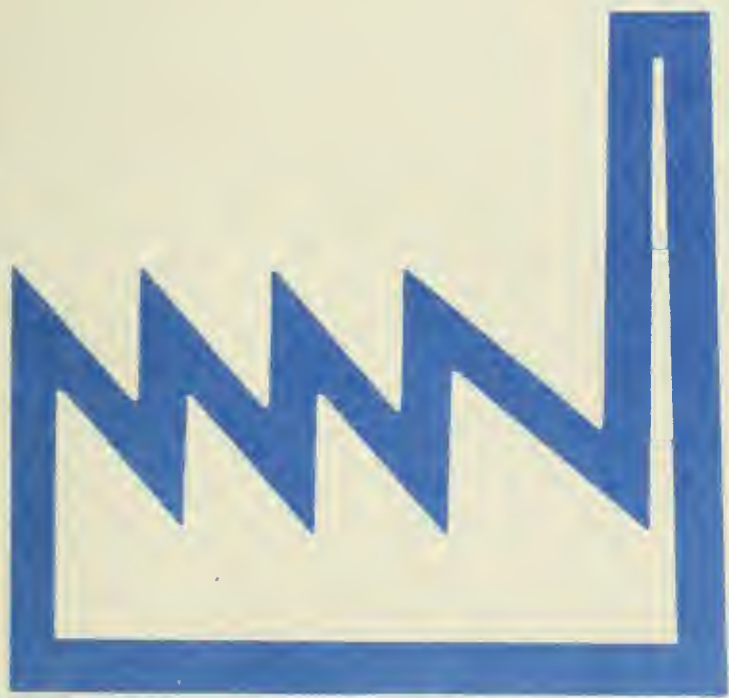
MC87-I-29A

INDUSTRY SERIES

## Petroleum and Coal Products

Industries 2911, 2951, 2952, 2992, and  
2999

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# ACKNOWLEDGMENTS

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Many persons participated in the various activities of the 1987 Census of Manufactures.

The overall planning and review of the census operations were performed by the staff of the Office of the Assistant Director for Economic and Agriculture Censuses.

This report was prepared in the Industry Division. **John Govoni**, Assistant Chief for Census/ASM Programs, was responsible for the overall planning, management, and coordination of the census of manufactures. Planning and implementation were under the direction of **Michael J. Zampogna**, Chief, Nondurables Branch, assisted by **Allen H. Foreman, Jr.**, Section Chief, with primary data analysis responsibilities performed by **Jack C. McMahon**.

Systems and procedures for mailout, receipt, correspondence, data input, industry classification, other clerical processing, administrative record processing, and quality control, along with the associated electronic computer programs, were developed in the Economic Surveys Division, **W. Joel Richardson**, Chief.

Mailout preparation and receipt operations, clerical and analytical review activities, data keying, and geocoding review were performed by the staff of the Data Preparation Division, **Joseph S. Harris**, Chief.

Geographic coding procedures and associated computer programs were developed by the staff of the Geography Division, **Robert W. Marx**, Chief.

The computer processing systems were developed and coordinated in the Economic Programming Division, **Barry M. Cohen**, Chief. **Hyman Chansky**, Assistant Division Chief for Industry Programs, was responsible for implementation of the computer systems. The computer programs were prepared under the supervision of **George D. Anderson**, Chief, Minerals and Manufactures Branch, assisted by **Barbara Lambert**, **Gerald Turnage**, and **Gary Sheridan**.

Computer processing was performed in the Computer Services Division, **Marvin D. Raines**, Chief.

The planning, design, review, and composition of report forms were performed in the Administrative Services Division, **Michael G. Garland**, Chief.

The staff of Publications Services Division, **Walter C. Odom**, Chief, performed publication planning, design, composition, editorial review, and printing planning and procurement. **Cynthia G. Brooks** provided publication coordination and editing.

Special acknowledgment is also due the many businesses whose cooperation has contributed to the publication of these data.

If you have any questions concerning the statistics in this report, call (301) 763-2510.

EX-115  
REF  
HD  
972cl  
1152X  
1987c  
no. 29A-  
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Issued April 1990



**U.S. Department of Commerce**  
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**Library of Congress Cataloging-in-Publication Data**

Census of manufactures (1987). Industry series.  
1987 census of manufactures. Industry series.

"MC87-I- ."

LC holdings recorded in Shelflist only.

I. United States. Bureau of the Census. II. Title.

HD9724.C4 1988a 338'.02'0973 88-600160

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For sale by Superintendent of Documents, U.S. Government  
Printing Office, Washington, DC 20402.



# INTRODUCTION

## PURPOSE AND USES OF THE ECONOMIC CENSUSES

The economic censuses are the major source of facts about the structure and functioning of the Nation's economy. They provide essential information for government, business, industry, and the general public.

*Economic censuses furnish an important part of the framework for such composite measures as the gross national product, input-output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions.*

*Policy-making agencies of the Federal Government use the data, especially in monitoring economic activity and providing assistance to business.*

*State and local governments use the data to assess business activities and tax bases within their jurisdictions and to develop programs to attract business.*

*Trade associations study trends in their own and competing industries, and keep their members informed of market changes.*

*Individual businesses use the data to locate potential markets and to analyze their own production and sales performance relative to industry or area averages.*

## AUTHORITY AND SCOPE

Title 13 of the United States Code (sections 131, 191, and 224) directs the Census Bureau to take the economic censuses every 5 years, covering years ending in 2 and 7. The 1987 Economic Censuses consist of the

- Census of Retail Trade
- Census of Wholesale Trade
- Census of Service Industries
- Census of Transportation
- Census of Manufactures
- Census of Mineral Industries
- Census of Construction Industries

Special programs also cover enterprise statistics and minority-owned and women-owned businesses. (The 1987 Census of Agriculture and 1987 Census of Governments are conducted separately.) The next economic censuses are scheduled to be taken in 1993 covering the year 1992.

## AVAILABILITY OF THE DATA

The results of each of the economic censuses are available in printed reports, for sale by the U.S. Government Printing Office, and on microfiche, computer tape, compact discs with read-only memory, and flexible diskettes, for sale by the Census Bureau. Order forms for all types of products are available on request from Customer Services, Census Bureau, Washington, DC 20233. A more complete description of publications being issued from this census is on the inside back cover of this document.

Census facts are also widely disseminated by trade associations, business journals, and newspapers. Volumes containing census statistics are available in most major public and college libraries. Finally, State Data Centers in every State and Business and Industry Data Centers in many States also supply economic census statistics.

## WHAT'S NEW IN 1987

Several changes have taken place for the 1987 censuses. Data will be reported on the basis of the newly revised Standard Industrial Classification (SIC) system with selected reports including "bridge tables," linking the old and new classification systems. A new set of metropolitan areas has been adopted, and more detailed information will be available for businesses with no paid employees. For additional information on these changes, review the subsequent text.

## HISTORICAL INFORMATION

The economic censuses have been taken together as an integrated program at 5-year intervals since 1967, and before that for 1963, 1958, and 1954. Prior to that time, the individual censuses were taken separately at varying intervals.

The economic censuses trace their beginnings to the 1810 Decennial Census, when questions on manufacturing were included with those for population. Coverage of economic activities was expanded for 1840 and subsequent censuses to include mining and some commercial



activities. In 1902, Congress established a permanent Census Bureau and directed that a census of manufactures be taken every 5 years. The 1905 manufactures census was the first time a census was taken apart from the regular every-10-year population census.

The first census of business was taken in 1930, covering 1929. Initially it covered retail and wholesale trade, and construction industries, but it was broadened in 1933 to include some of the service trades.

The 1954 economic censuses were the first to be fully integrated—providing comparable census data across economic sectors, using consistent time periods, concepts, definitions, classifications, and reporting units. These were the first censuses to be taken by mail, using lists of firms provided by the administrative records of other federal agencies. Since 1963, administrative records have also been used to provide basic statistics as well for very small firms, reducing or eliminating the need to send them census questionnaires. The Enterprise Statistics Program, which publishes combined data from the economic censuses, was made possible with the implementation of the integrated census program in 1954.

The range of industries covered in the economic censuses has continued to expand. The Census of Construction Industries began on a regular basis in 1967, and the scope of service industries was broadened in 1967, 1977, and 1987. The Census of Transportation began in 1963 as a set of surveys covering travel, transportation of commodities, and trucks. New for 1987 are publications reporting on business establishments engaged in several transportation industries, paralleling the data on establishments in other sectors. This is part of a gradual expansion in coverage of industries previously subjected to government regulation. The Survey of Minority-Owned Business Enterprises was first conducted as a special project in 1969 and was incorporated into the economic censuses in 1972 along with the Survey of Women-Owned Businesses.

Economic censuses have also been taken in Puerto Rico since 1909, in the Virgin Islands and Guam since 1958, and in the Northern Mariana Islands since 1982.

Statistical reports from the 1982 and earlier censuses provide historical figures for the study of long-term time series, and are available in some large libraries. All of the census data published since 1967 are still available for sale on microfiche from the Census Bureau.

## **AVAILABILITY OF MORE FREQUENT ECONOMIC DATA**

While the censuses provide complete enumerations every 5 years, there are many needs for more frequent data as well. The Census Bureau conducts a number of monthly, quarterly, and annual surveys, the results of which appear in publication series such as *Current Business Reports* (retail and wholesale trade and service industries), the *Annual Survey of Manufactures*, *Current Industrial Reports*, and the *Quarterly Financial Report*. Most of these surveys, while providing more frequent

observations, yield less kind-of-business and geographic detail than the censuses. The *County Business Patterns* program offers annual statistics on the number of establishments, employment, and payroll classified by industry within each county.

## **SOURCES FOR MORE INFORMATION**

More information about the scope, coverage, classification system, data items, and publications for each of the economic censuses and related surveys is published in the *Guide to the 1987 Economic Censuses and Related Statistics*. More information on the methodology, procedures, and history of the censuses will be published in the *History of the 1987 Economic Censuses*. Contact Customer Services for information on availability.

## **CENSUS OF MANUFACTURES**

### **General**

This report, from the 1987 Census of Manufactures, is one of a series of 83 industry reports, each of which provides statistics for individual industries or groups of related industries. Additional separate reports will be issued for each State and the District of Columbia and for special subjects such as type of organization, distribution of sales by class of customer, concentration ratios and water use in manufacturing.

The industry reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, capital expenditures, product shipments, etc.

State reports present similar statistics for each State and its important metropolitan statistical areas (MSA's), counties, and places. Selected statistical totals for "all manufacturing" have been shown in the State reports for MSA's with 250 employees or more and for counties and places with 450 employees or more.

The *General Summary* report will contain industry, product class, and geographic area statistics summarized in one report. The introduction to the *General Summary* discusses, at greater length, many of the subjects described in this introduction. For example, the *General Summary* text will discuss the relationship of value added by manufacture to National income by industry of origin, the changes in statistical concepts over the history of the censuses, and the valuation problems arising from intracompany transfers between manufacturing plants of a company and between manufacturing plants and sales offices and sales branches of a company.

### **Scope of Census and Definition of Manufacturing**

The 1987 Census of Manufactures covers all establishments with one paid employee or more primarily engaged in manufacturing as defined in the *1987 Standard Industrial*



*Classification (SIC) Manual*<sup>1</sup>. This is the system of industrial classification developed by experts on classification in Government and private industry under the guidance of the Office of Information and Regulatory Affairs, Office of Management and Budget. This classification system is used by Government agencies as well as many organizations outside the Government.

The SIC Manual defines manufacturing as the mechanical or chemical transformation of substances or materials into new products. The assembly of component parts of products also is considered to be manufacturing if the resulting product is neither a structure nor other fixed improvement. These activities are usually carried on in plants, factories, or mills that characteristically use power-driven machines and materials-handling equipment.

Manufacturing production is usually carried on for the wholesale market, for transfers to other plants of the same company, or to the order of industrial users rather than for direct sale to the household consumer. Some manufacturers in a few industries sell chiefly at retail to household consumers through the mail, through house-to-house routes, or through salespersons. Some activities of a service nature (enameling, engraving, etc.) are included in manufacturing when they are performed primarily for trade. They are considered nonmanufacturing when they are performed primarily to the order of the household consumer.

## **Relationship Between Annual Survey of Manufactures and Census of Manufactures**

The Bureau of the Census conducts the annual survey of manufactures (ASM) in each of the 4 years between the censuses of manufactures. The ASM is a probability-based sample of approximately 56,000 establishments and collects the same industry statistics (employment, payroll, value of shipments, etc.) as the census of manufactures. In addition to collecting the information normally requested on the census form, the establishments in the ASM sample are requested to supply information on assets, capital expenditures, retirements, depreciation, rental payments, supplemental labor costs, costs of purchased services, and foreign content of materials consumed. Except for supplemental labor costs, the extra ASM items are collected only in census years.

## **Establishment Basis of Reporting**

The census of manufactures is conducted on an establishment basis. A company operating at more than one location is required to file a separate report for each location. The ASM also is conducted on an establishment basis, but separate reports are filed for just those establishments selected in the sample. Companies engaged in

distinctly different lines of activity at one location are requested to submit separate reports if the plant records permit such a separation and if the activities are substantial in size.

In 1987, as in earlier years, a minimum size limit was set for inclusion of establishments in the census. All establishments employing one person or more at any time during the census year are included. The same size limitation has applied since 1947 in censuses and annual surveys of manufactures. In the 1939 and earlier censuses, establishments with less than \$5,000 value of products were excluded. The change in the minimum size limit in 1947 does not appreciably affect the historical comparability of the census figures except for data on number of establishments for a few industries. This report excludes information for separately operated administrative offices, warehouses, garages, and other auxiliary units that service manufacturing establishments of the same company (see Auxiliaries).

## **Manufacturing Universe and Census Report Forms**

The 1987 Census of Manufactures universe includes approximately 350,000 establishments. The amounts of information requested from manufacturing establishments were dependent upon a number of factors. The more important considerations were the size of the company and whether it was included in the annual survey of manufactures. The methods of obtaining information for the various subsets of the universe to arrive at the aggregate figures shown in the publication are described below:

### **1. Small Single-Establishment Companies Not Sent a Report Form**

In the 1987 Census of Manufactures, approximately 150,000 small single-establishment companies were excused from filing reports. Selection of these small establishments was done on an industry-by-industry basis and was based on annual payroll and total shipments data as well as on the industry classification codes contained in the administrative records of Federal agencies. The cutoffs were selected so that these administrative-records cases would account for no more than 3 percent of the value of shipments for all manufacturing. Generally, all single-establishment companies with less than five employees were excused, while all establishments with more than 20 employees were mailed forms.

Information on the physical location of the establishment, as well as information on payrolls, receipts (shipments), and industry classification, was obtained from the administrative records of other Federal agencies under special arrangements, which safeguarded their confidentiality. Estimates of data for these small establishments were developed using industry averages in conjunction with the administrative information. The value of shipments and cost of materials

<sup>1</sup>Standard Industrial Classification Manual: 1987: For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, Stock No. 041-001-00314-2.



were not distributed among specific products and materials for these establishments but were included in the product and material "not specified by kind" (n.s.k.) categories.

The industry classification codes included in the administrative-records files were assigned on the basis of brief descriptions of the general activity of the establishment. As a result, an indeterminate number of establishments were erroneously coded at the four-digit SIC level. This was especially true whenever there was a relatively fine line of demarcation between industries or between manufacturing and nonmanufacturing activity.

Sometimes these administrative-record cases were only given a two- or three-digit SIC group. For the 1987 Census of Manufactures, these establishments were sent a separate classification form, which requested information on the products and services of the establishment. This form was used to code many of these establishments to the four-digit SIC level. Establishments that did not return the classification form were coded later to those four-digit SIC industries identified as "not elsewhere classified" (n.e.c.) within the given two- or three-digit industry groups.

As a result of these situations, a number of small establishments may have been misclassified by industry. However, such possible misclassification has no significant effect on the statistics other than on the number of companies and establishments.

The total establishment count for individual industries should be viewed as an approximation rather than a precise measurement. The counts for establishments with 20 employees or more are far more reliable than the count of total number of establishments.

## 2. Establishments Sent a Report Form

The 200,000 establishments covered in the mail canvass were divided into three groups:

- a. **ASM sample establishments**—This group consisted of approximately 56,000 establishments covering all the units of large manufacturing establishments as well as a sample of the medium and smaller establishments. The probability of selection was proportionate to size (see appendix, Annual Survey of Manufactures).

In a census of manufactures year, the ASM report form (MA-1000) replaces the first page of the regular census form for those establishments included in the ASM. In addition to information on employment, payroll, and other items normally requested on the regular census form, establishments in the ASM sample were requested to supply information on assets, capital expenditures, retirements, depreciation, rental payments, supplemental labor costs, and costs of purchased services. See appendix A, section 2, for an explanation of these items.

The census part of the report form is one of approximately 200 versions containing product, material, and special inquiries. The diversity of manufacturing activities necessitated the use of these many forms to canvass the 459 manufacturing industries. Each form was developed for a group of related industries.

Appearing on each form was a list of products primary to the group of related industries as well as secondary products and miscellaneous services that establishments classified in these industries were likely to be performing. Respondents were requested to identify the products, the value of each product, and, in a large number of cases, the quantity of the product shipped during the survey year. Space also was provided for the respondent to describe products not specifically identified on the form.

The report form also contained a materials-consumed inquiry, which varied from form to form depending on the industries being canvassed. The respondents were asked to review a list of materials generally used in their production processes. From this list, each establishment was requested to identify those materials consumed during the survey year, the cost of each, and, in certain cases, the quantity consumed. Once again, space was provided for the respondent to describe significant material not identified on the form.

Finally, a wide variety of special inquiries was included to measure activities peculiar to a given industry, such as operations performed and equipment used.

- b. **Large and medium establishments (non-ASM)**—Approximately 84,000 establishments were included in this group. A variable cutoff, based on administrative-records payroll data and determined on an industry-by-industry basis, was used to select those establishments that were to receive one of the approximately 200 census of manufactures regular forms. The first page, requesting establishment data for items such as employment and payroll, was standard but did not contain the detailed statistics included on the ASM form. The product, material, and special inquiry sections supplied were based on the historical industry classification of the establishment.
- c. **Small single-establishment companies (non-ASM)**—This group consisted of approximately 60,000 establishments. For those industries where application of the variable cutoff for administrative-records cases resulted in a large number of small establishments being included in the mail canvass, an abbreviated or "short" form was used. These establishments received one of the approximately 80 versions of the short form, which requested



summary product and material data and totals but no details on employment, payrolls, cost of materials, inventories, and capital expenditures.

Use of the short form has no adverse effect on published totals for the industry statistics; the same data were collected on the short form as on the long form. However, detailed information on materials consumed was not collected on the short form; thus its use would increase the value of the n.s.k. categories.

## Auxiliaries

In this industry report, the data on employment and payroll are limited to operating manufacturing establishments. The census report form filed for auxiliaries (ES-9200) requested a description of the activity of the establishments serviced. However, the manufacturing auxiliaries were coded only to the two-digit major group of the establishments they served; whereas, the operating establishments were coded to a four-digit manufacturing industry. Data for the approximately 10,000 separately operated auxiliaries are included in the geographic area series and in a report issued as part of the 1987 Enterprise Statistics Survey.

Auxiliaries are establishments whose employees are primarily engaged in performing supporting services for other establishments of the same company, rather than for the general public or for other business firms. They can be at different locations from the establishments served or at the same location as one of those establishments but not operating as an integral part thereof and serving two establishments or more. Where auxiliary operations are conducted at the same location as the manufacturing operation and operate as an integral part thereof, they usually are included in the report for the operating manufacturing establishment.

Included in the broad category of auxiliaries are administrative offices. Employees in administrative offices are concerned with the general management of multiestablishment companies, i.e., with the general supervision and control of two units or more, such as manufacturing plants, mines, sales branches, or stores. The functions of these employees may include (1) program planning, including sales research and coordination of purchasing, production, and distribution; (2) company purchasing, including general contracts and purchasing methods; (3) company financial policy and accounting; (4) general engineering, including design of product machinery and equipment, and direction of engineering effort conducted at the individual operation locations; (5) direction of company personnel matters; and (6) legal and patent matters.

Other types of auxiliaries serving the plants or central management of the company include purchasing offices, sales promotion offices, research and development organizations, etc.

## Industry Classification of Establishments

Each of the establishments covered in the census was classified in 1 of 459 manufacturing industries in accordance with the industry definitions in the 1987 SIC Manual. The 1987 edition of this manual represents a major revision for manufacturing industries from the 1972 edition and its 1977 supplement. Appendix A of the 1987 Manual notes the revisions in the four-digit industry levels between 1972/77 and 1987.

An industry is generally defined as a group of establishments producing the same product or a closely related group of products. The product groupings from which industry classifications are derived are based on considerations such as similarity of manufacturing processes, types of materials used, types of customers, and the like. The resulting group of establishments must be significant in terms of number, value added by manufacture, value of shipments, and number of employees. The system operates in such a way that the definitions progressively become narrower with successive additions of numerical digits. For 1987, there are 20 major groups (two-digit SIC), 139 industry groups (three-digit SIC), and 459 industries (four-digit SIC). This represents an expansion of four-digit industries from 452 in 1972/77 and a reduction of three-digit groups from 143 in 1972/77. Product classes and products of the manufacturing industries have been assigned codes based on the industry from which they originate. There are about 11,000 products identified by a seven-digit code. The seven-digit products are considered the primary products of the industry with the same four digits.

Accordingly, an establishment is usually classified in a particular industry on the basis of its major activity during a particular year, i.e., production of the products primary to that industry exceeds, in value, production of the products primary to any other single industry. In a few instances, however, the industry classification of an establishment is not only determined by the products it makes but also by the process employed in operations. Refining of nonferrous metals from ore or rolling and drawing of nonferrous metals (processes which involve heavy capitalization in specialized equipment) would be classified according to the process used during a census year. These establishments then would be "frozen" in that industry during the following ASM years.

In either a census or ASM year, establishments included in the ASM sample with certainty weight, other than those involved with heavily capitalized activities described above, are reclassified by industry only if the change in the primary activity from the prior year is significant or the change has occurred for 2 successive years. This procedure prevents reclassification when there are minor shifts in product mix.

In ASM years, establishments included in the ASM sample with noncertainty weight are not shifted from one industry classification to another. They are retained in the industry where they were classified in the base census year (see appendix, Annual Survey of Manufactures).



However, in the following census year, these ASM plants are allowed to shift from one industry to another.

The result of these rules covering the switching of plants from one industry classification to another is that, at the aggregate level, some industries comprise different mixes of establishments between survey years, and establishment data for such industry statistics as employment and payroll may be tabulated in different industries between survey years. Hence, comparisons between prior-year and current-year published totals, particularly at the four-digit SIC level, should be viewed with caution. This is particularly true for the comparison between the data shown for a census year versus the data shown for the previous ASM year.

As previously noted, the small establishments that may have been misclassified by industry are usually administrative-record cases whose industry codes were assigned on the basis of incomplete descriptions of the general activity of the establishment. Such possible misclassifications have no significant effect on the statistics other than on the number of companies and establishments.

While some establishments produce only the primary products of the industry in which they are classified, all establishments of an industry rarely specialize to this extent. The industry statistics (employment, inventories, value added by manufacture, total value of shipments including resales and miscellaneous receipts, etc.) shown in tables 1a through 5a, therefore, reflect not only the primary activities of the establishments in that industry but also their secondary activities. The product statistics in table 6a represent the output of all establishments whether or not they are classified in the same industry as the product. For this reason, in relating the industry statistics, especially the value of shipments to the product statistics, the composition of the industry's output shown in table 5b should be considered.

The extent to which industry and product statistics may be matched with each other is measured by two ratios which are computed from the figures shown in table 5b. The first of these ratios, called the primary product specialization ratio, measures the proportion of product shipments (both primary and secondary) of the establishments classified in the industry represented by the primary products of those establishments. The second ratio, called the coverage ratio, is the proportion of primary products shipped by the establishments classified in the industry to total shipments of such products by all manufacturing establishments.

However, establishments making products falling into the same industry category may use a variety of processes and materials to produce them. Also, the same industry classification (based on end products) may include both establishments that are highly integrated and those that put only the finishing touches on an already highly fabricated item. For example, the refrigeration equipment industry includes instances of almost complete integration (production of the compressor, condensing unit, electric motor, casting, stamping of the case, and final assembly) all

carried on at one plant. On the other hand, the condensing unit, the motor, and the case may be purchased and only assembled into the finished product.

In some instances, separate industry categories have been established for integrated and nonintegrated establishments. For other industries, the census provides separate statistics on the production of intermediate commodities made and used in the producing plant. For some industries characterized by many plants of the same company, separate figures on interplant transfers of products usually are shown.

Differences in the integration of production processes, types of operations, and alternatives in types of materials used should be considered when relating the industry statistics (employment, payrolls, value added, etc.) to the product and material data.

### **Value of Shipments for the Industry Compared With Value of Product Shipments**

This report shows value of shipments data for industries and products. In tables 1a through 5a, these data represent the total value of shipments of all establishments classified in a particular industry. The data include the shipments of the products classified in the industry (primary to the industry), products classified in other industries (secondary to the industry), and miscellaneous receipts (repair work, sale of scrap, research and development, installation receipts, and resales). Value of product shipments shown in table 6a represents the total value of all products shipped that are classified as primary to an industry.

### **CENSUS DISCLOSURE RULES**

In accordance with Federal law governing census reports, no data are published that would disclose the data for an individual establishment or company. However, the number of establishments classified in a specific industry is not considered a disclosure, so this information may be released even though other information is withheld.

The disclosure analysis for the industry statistics in tables 1a through 5a of this report is based on the total value of shipments. When the total value of shipments cannot be shown without disclosing information for individual companies, the complete line is suppressed. However, the suppressed data are included in higher-level totals. Additional disclosure analysis is performed for new capital expenditures that can be suppressed even though value of shipments data are publishable.

### **SPECIAL TABULATIONS**

Special tabulations of data collected in the 1987 Census of Manufactures may be obtained on computer tape or in tabular form. The data will be in summary form and subject to the same rules prohibiting disclosure of confidential

information (including name, address, kind of business, or other data for individual business establishments or companies) as are the regular publications.

Special tabulations are prepared on a cost basis. A request for a cost estimate, as well as exact specifications on the type and format of the data to be provided, should be directed to the Chief, Industry Division, Bureau of the Census, Washington, DC 20233.

ABBREVIATIONS AND SYMBOLS

The following abbreviations and symbols are used in this publication:

- Represents zero.
- (D) Withheld to avoid disclosing data for individual companies; data are included in higher level totals.
- (NA) Not available.
- (NC) Not comparable.
- (S) Withheld because estimate did not meet publication standards.
- (X) Not applicable.
- (Z) Less than half the unit shown.
- do Ditto.

- n.e.c. Not elsewhere classified.
- n.s.k. Not specified by kind.
- pt. Part.
- r Revised.
- SIC Standard Industrial Classification.

Other abbreviations, such as lb, gal, yd, doz, bbl, and s tons, are used in the customary sense.

CONTACTS FOR DATA USERS

Subject Area	Contact	Phone
Census/ASM		
Durables	Kenneth Hansen	(301) 763-7304
Nondurables	Michael Zampogna	(301) 763-2510
Current Industrial Reports		
Durables	Malcolm Bernhardt	(301) 763-2518
Nondurables	Thomas Flood	(301) 763-5911
Import/Export Publications	Foreign Trade Division	(301) 763-5140
Industry Analysis and Forecasts	International Trade Administration	(202) 377-4356



# Users' Guide for Locating Statistics in This Report by Table Number

For explanation of terms, see appendixes

Item	Four-digit industry statistics							Five-digit product class and seven-digit product statistics			
	Historical	Operating ratios	By geographic area	Summary and supplemental	By employment size	By industry and product class specialization	Materials consumed by kind	Industry-product analysis	Product shipments	Product class by geographic area	Historical product class
Number of companies .....	1a			3a					*6a		
Number of establishments...	1a		2	3a	4	5a					
Employment and payroll: .....											
Number of employees .....	1a	1b	2	3a	4	5a					
Payroll .....	1a	1b	2	3a	4	5a					
Supplemental labor costs ...				3a							
Production workers .....	1a	1b	2	3a	4	5a					
Production- worker hours...	1a	1b	2	3a	4	5a					
Production- worker wages...	1a	1b	2	3a	4	5a					
Shipments, cost of materials, and value added:											
Value of shipments (four-digit) .....	1a	1b	2	3a	4	5a		5b			
Product class shipments (five-digits) .....									6a	6b	6c
Product shipments (seven-digit) .....									6a		
Value added by manufacture .....	1a	1b	2	3a	4	5a					
Cost of materials .....	1a	1b	2	3a	4	5a					
Fuels and electric energy ...				3a							
Materials consumed by kind .							7				
Inventories:											
Total, end of year .....	1a			3a	4						
By stage of fabrication .....				3a							
Capital expenditures, assets, rental payments, and purchased services:											
New capital expenditures...	1a		2	3b	4	5a					
Used plant and equipment expenditures .....				3b							
Gross assets .....				3b							
Depreciation .....				3b							
Retirements of buildings and machinery .....				3b							
Rental payments .....				3b							
Foreign content of materials consumed .....				3c							
Purchased services .....				3c							
Ratios:											
Specialization .....	1a			3a				5b			
Coverage .....	1a			3a				5b			

\*Number of companies with shipments of more than \$100 thousand.



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# DESCRIPTION OF INDUSTRIES AND SUMMARY OF FINDINGS

This report shows 1987 Census of Manufactures statistics for establishments classified in each of the following industries:

## SIC code and title

2911	Petroleum Refining
2951	Asphalt Paving Mixtures and Blocks
2952	Asphalt Felts and Coatings
2992	Lubricating Oils and Greases
2999	Petroleum and Coal Products, N.E.C.

The industry statistics (employment, payroll, cost of materials, value of shipments, inventories, etc.) are reported for each establishment as a whole. Aggregates of such data for an industry reflect not only the primary activities of the establishments but also their activities in the manufacture of secondary products as well as their miscellaneous activities (contract work on materials owned by others, repair work, etc.). This fact should be taken into account when comparing industry statistics (tables 1 through 5a) with product statistics (table 6) showing shipments by all industries of the primary products of the specified industry. The extent of the "product mix" is indicated in table 5b, which shows the value of primary and secondary products shipped by establishments classified in the specified industry and the value of primary products of the industry shipped as secondary products by establishments classified in other industries.

Small single-establishment companies with up to 20 employees (cutoff varied by industry) were excluded from the mail portion of the census. For these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated), data on payrolls and receipts were obtained from administrative records of other Federal agencies. The remaining statistics were developed from industry averages.

Establishment data were tabulated based on industry definitions included in the 1987 Standard Industrial Classification (SIC) Manual<sup>1</sup>. The 1987 edition represents a major revision for manufacturing industries from the 1972 edition and its 1977 supplement. In addition to the 1987 SIC revision, changes were made to the product class (five-digit) and product code (seven-digit) categories. The

product class and product code comparability between the 1987 and 1982 censuses is shown in the appendixes. These appendixes present, in tabular form, the linkage from 1987 to 1982.

All dollar figures included in this report are at prices current for the year specified and, therefore, unadjusted for changes in price levels. Consequently, when making comparisons to prior years, users should take into consideration the inflation that has occurred.

## INDUSTRY 2911, PETROLEUM REFINING

This industry is made up of establishments primarily engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, and lubricants, through fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other processes. Establishments of this industry also produce aliphatic and aromatic chemicals as byproducts. Certain products primary to industry 2911 also are primary to industries 2865, 2869, 2992, and 2999. Establishments primarily engaged in producing natural gasoline from natural gas are classified in mining industries. Those manufacturing lubricating oils and greases by blending and compounding purchased materials are included in industry 2992. Establishments primarily re-refining used lubricating oils are classified in industry 2992. Establishments primarily engaged in manufacturing cyclic and acyclic organic chemicals are classified in Major Group 28.

The 1987 definition of this industry has been revised from that used in the 1972 Standard Industrial Classification (SIC) manual. However, the SIC number and title are unchanged. Product classes 2911A, Liquid Refinery Gases, Including Other Aliphatics; 2911C, Aromatics; and product code 2911D 92, Waxes, classified in 1972 SIC-based industry 2911 are now classified in industries 2869, 2865, and 2999, respectively. The effect of the revisions on the data is summarized in tables 1c-1 and 1c-2. During the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 2911, Petroleum Refining, had employment of 74.6 thousand. The leading States in employment in 1987 were Texas, California, Louisiana, and Pennsylvania, accounting for 63 percent of the industry's employment.

The total value of shipments for establishments classified in this industry was \$118.2 billion.

<sup>1</sup>Standard Industrial Classification Manual: 1987. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Stock No. 041-001-00314-2.



Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 2911 shipped \$114.1 billion of petroleum refining products considered primary to the industry, \$894.1 million of secondary products, and had \$3.2 billion of miscellaneous receipts. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 99 percent (specialization ratio).

Establishments in this industry also accounted for 99 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). The products primary to industry 2911, no matter in what industry they were produced, appear in table 6a and aggregate to \$114.3 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the petroleum refining industry amounted to \$104.8 billion. Data on specific materials consumed appear in table 7.

No establishments in this industry were excluded from the mail portion of the census. The data for a small number of establishments whose reports were not received at the time the data were tabulated were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 3 percent of total value of shipments.

## **INDUSTRY 2951, ASPHALT PAVING MIXTURES AND BLOCKS**

This industry is made up of establishments primarily engaged in manufacturing asphalt and tar paving mixtures; and paving blocks made of asphalt and various compositions of asphalt or tar with other materials. Establishments primarily engaged in manufacturing brick, concrete, granite, and stone paving blocks are classified in Major Group 32.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 2951, Asphalt Paving Mixtures and Blocks, had employment of 14.6 thousand. The employment figure was 4 percent below the 15.2 thousand reported in 1982. Compared with 1986, employment decreased 1 percent. The 1986 data are based on the Bureau's annual survey of manufactures (ASM), which is a sample survey conducted each year between censuses. The leading States in employment in 1987 were New York, California, Ohio, and Massachusetts. This represents a shift from 1982 when New York, Pennsylvania, California, and Washington were the leading States.

The total value of shipments for establishments classified in this industry was \$4.3 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 2951 shipped \$3.8 billion of asphalt paving mixtures and block products considered primary to the industry, \$248.8 million of secondary products, and had \$251.3 million of miscellaneous receipts. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 94 percent (specialization ratio). In 1982, the specialization ratio was 93 percent.

Establishments in this industry also accounted for 94 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 96 percent. The products primary to industry 2951, no matter in what industry they were produced, appear in table 6a and aggregate to \$4.1 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the asphalt paving mixtures and blocks industry amounted to \$2.8 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 5 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 18 percent of total value of shipments.

## **INDUSTRY 2952, ASPHALT FELTS AND COATINGS**

This industry is made up of establishments primarily engaged in manufacturing, from purchased materials, asphalt and other saturated felts in roll or shingle form, either smooth or faced with grit, and in manufacturing roofing cements and coatings. Establishments primarily engaged in manufacturing paint are classified in industry 2851, and those manufacturing linoleum and tile cement are classified in industry 2891.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 2952, Asphalt Felts and Coatings, had employment of 13.5 thousand. The employment figure was 5 percent below the 14.2 thousand reported in 1982. Compared with 1986, employment increased 3 percent. The 1986 data are based on the Bureau's annual survey of manufactures (ASM), which is a sample survey conducted each year



between censuses. The leading States in employment in 1987 were Texas, Ohio, California, and Illinois, accounting for 36 percent of the industry's employment. These same States were the leaders in 1982, when they accounted for 38 percent of the industry's employment.

The total value of shipments for establishments classified in this industry was \$3.4 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 2952 shipped \$3.1 billion of asphalt felts and coating products considered primary to the industry, \$112.7 million of secondary products, and had \$155.2 million of miscellaneous receipts. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 97 percent (specialization ratio). In 1982, the specialization ratio was 95 percent.

Establishments in this industry also accounted for 99 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 98 percent. The products primary to industry 2952, no matter in what industry they were produced, appear in table 6a and aggregate to \$3.2 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the asphalt felts and coatings industry amounted to \$2.1 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 10 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 8 percent of total value of shipments.

## **INDUSTRY 2992, LUBRICATING OILS AND GREASES**

This industry is made up of establishments primarily engaged in blending, compounding, and re-refining lubricating oils and greases from purchased mineral, animal, and vegetable materials. Petroleum refineries engaged in the production of lubricating oil and greases are classified in industry 2911.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 2992, Lubricating Oils and Greases, had employment of 11.2 thousand. The employment figure was 6 percent below the 11.9 thousand reported in 1982. Compared with 1986, employment increased 8 percent. The 1986 data are

based on the Bureau's annual survey of manufactures (ASM), which is a sample survey conducted each year between censuses. The leading States in employment in 1987 were Illinois, Pennsylvania, California, and Ohio, accounting for 38 percent of the industry's employment. This represents a shift from 1982 when Pennsylvania, California, Illinois, and Texas accounted for approximately 45 percent of the industry's employment.

The total value of shipments for establishments classified in this industry was \$3.8 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 2992 shipped \$3.4 billion of lubricating oils and grease products considered primary to the industry, \$172.4 million of secondary products, and had \$204.8 million of miscellaneous receipts. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 95 percent (specialization ratio). In 1982, the specialization ratio was 94 percent.

Establishments in this industry also accounted for 94 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 95 percent. The products primary to industry 2992, no matter in what industry they were produced, appear in table 6a and aggregate to \$3.6 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the lubricating oils and greases industry amounted to \$2.6 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 5 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 16 percent of total value of shipments.

## **INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C.**

This industry is made up of establishments primarily engaged in manufacturing packaged fuel, powdered fuel, and other products of petroleum and coal, not elsewhere classified. Certain products primary to industry 2999 also are primary to industry 2911.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same. However, industry 2999 now includes 1972 SIC-based product code 2911D 92, Waxes. The effect of the revisions on the data is summarized in tables 1c-1 and 1c-2. During



the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 2999, Petroleum and Coal Products, N.E.C., had employment of 1.9 thousand. The leading States in employment in 1987 were Texas, California, Illinois, and Louisiana, accounting for 53 percent of the industry's employment.

The total value of shipments for establishments classified in this industry was \$713.1 million.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 2999 shipped \$612.1 million of petroleum and coal products, n.e.c., products considered primary to the industry, \$28.8 million of secondary products, and had \$72.2 million of miscellaneous receipts. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 95 percent (specialization ratio).

Establishments in this industry also accounted for 94 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). The products primary to industry 2999, no matter in what industry they were produced, appear in table 6a and aggregate to \$647.9 million. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the petroleum and coal products, n.e.c., industry amounted to \$440.6 million. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 5 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 13 percent of total value of shipments.

**Table 1a-1. Historical Statistics for the Industry (1987 Basis): 1987 and Earlier Years**

[Industries with only 1987 data are revised for 1987. Table 1a-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year <sup>1</sup>	Companies <sup>2</sup> (no.)	All establishments <sup>3</sup>		All employees		Production workers			Value added by manufact- ure <sup>4</sup> (million dollars)	Cost of materials <sup>5</sup> (million dollars)	Value of shipments (million dollars)	New capital expend- itures <sup>6</sup> (million dollars)	End-of- year inven- tories <sup>4</sup> (million dollars)	Ratios	
		Total (no.)	With 20 employ- ees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						Speci- alization <sup>7</sup> (per- cent)	Cover- age <sup>8</sup> (per- cent)
INDUSTRY 2911, PETROLEUM REFINING <sup>9</sup>															
1987 Census ---	201	309	221	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4	8 795.0	99	99
INDUSTRY 2951, ASPHALT PAVING MIXTURES AND BLOCKS															
1987 Census ---	542	1 101	199	14.6	430.1	10.0	20.9	266.7	1 602.9	2 758.2	4 346.2	123.4	203.9	94	94
1986 ASM-----	(NA)	(NA)	(NA)	14.7	404.7	10.6	22.1	255.4	1 330.9	2 644.0	4 024.1	102.9	183.4	(NA)	(NA)
1985 ASM-----	(NA)	(NA)	(NA)	14.6	375.4	10.6	23.7	238.6	1 164.9	2 811.9	3 971.8	<sup>10</sup> 144.1	240.4	(NA)	(NA)
1984 ASM-----	(NA)	(NA)	(NA)	14.4	358.3	10.3	22.6	230.3	1 072.5	2 445.9	3 515.9	<sup>10</sup> 111.2	212.4	(NA)	(NA)
1983 ASM-----	(NA)	(NA)	(NA)	15.0	343.4	10.7	22.1	230.5	1 005.2	2 242.1	3 237.4	<sup>10</sup> 48.1	176.4	(NA)	(NA)
1982 Census ---	569	1 034	202	15.2	340.5	11.1	22.2	229.1	925.9	2 162.4	3 098.6	76.1	162.1	93	96
1981 ASM-----	(NA)	(NA)	(NA)	12.0	248.1	8.7	17.3	161.3	705.7	1 515.8	2 222.8	44.7	103.0	(NA)	(NA)
1980 ASM-----	(NA)	(NA)	(NA)	12.6	249.7	9.2	18.9	162.9	727.8	1 523.7	2 244.7	55.3	103.1	(NA)	(NA)
1979 ASM-----	(NA)	(NA)	(NA)	12.9	236.5	9.7	20.3	165.2	660.8	1 372.0	2 026.6	62.1	87.1	(NA)	(NA)
1978 ASM-----	(NA)	(NA)	(NA)	13.5	251.0	10.5	22.4	180.1	750.8	1 333.6	2 070.4	<sup>10</sup> 69.6	110.9	(NA)	(NA)
1977 Census ---	590	1 023	165	12.9	190.6	9.7	20.2	134.3	507.8	1 072.1	1 578.3	57.3	62.8	95	93
1976 ASM-----	(NA)	(NA)	(NA)	12.9	159.5	9.6	18.6	105.7	450.8	795.9	1 250.6	<sup>10</sup> 62.2	51.1	(NA)	(NA)
1975 ASM-----	(NA)	(NA)	(NA)	13.0	156.4	9.7	20.8	105.5	428.4	781.2	1 237.2	<sup>10</sup> 51.3	54.0	(NA)	(NA)
1974 ASM-----	(NA)	(NA)	(NA)	14.7	147.9	9.4	20.6	102.2	468.2	772.7	1 234.0	<sup>10</sup> 48.2	51.1	(NA)	(NA)
1973 ASM-----	(NA)	(NA)	(NA)	12.4	141.7	9.1	19.3	98.3	388.5	574.0	967.5	54.4	27.2	(NA)	(NA)
1972 Census ---	586	964	169	13.9	147.7	10.0	21.4	100.8	403.1	527.2	922.5	56.3	38.5	93	90
INDUSTRY 2952, ASPHALT FELTS AND COATINGS															
1987 Census ---	162	266	145	13.5	354.9	9.7	20.2	237.3	1 284.1	2 147.2	3 402.9	89.8	266.4	97	99
1986 ASM-----	(NA)	(NA)	(NA)	13.1	340.1	9.3	19.4	220.8	1 164.5	2 279.4	3 474.9	89.0	251.1	(NA)	(NA)
1985 ASM-----	(NA)	(NA)	(NA)	14.4	331.7	10.1	20.6	223.1	1 015.7	2 506.7	3 515.5	101.4	312.0	(NA)	(NA)
1984 ASM-----	(NA)	(NA)	(NA)	14.5	329.7	10.5	21.6	221.3	1 083.6	2 402.8	3 487.7	69.4	292.2	(NA)	(NA)
1983 ASM-----	(NA)	(NA)	(NA)	14.5	312.9	10.6	22.7	212.5	892.6	2 373.6	3 256.6	<sup>10</sup> 56.0	297.1	(NA)	(NA)
1982 Census ---	147	273	155	14.2	288.7	10.4	21.0	195.1	816.9	1 993.7	2 849.5	57.1	256.9	95	98
1981 ASM-----	(NA)	(NA)	(NA)	17.1	334.3	12.4	25.6	228.2	803.1	2 118.2	2 885.5	<sup>10</sup> 81.1	325.6	(NA)	(NA)
1980 ASM-----	(NA)	(NA)	(NA)	18.7	334.5	13.4	28.7	229.1	904.6	2 011.5	2 884.7	67.9	271.4	(NA)	(NA)
1979 ASM-----	(NA)	(NA)	(NA)	22.4	374.1	16.5	35.5	256.3	1 020.5	1 937.5	2 921.9	70.7	236.1	(NA)	(NA)
1978 ASM-----	(NA)	(NA)	(NA)	21.2	329.9	15.9	35.1	228.0	985.7	1 666.7	2 651.3	70.0	176.9	(NA)	(NA)
1977 Census ---	146	275	164	19.5	271.7	14.3	31.0	185.9	764.2	1 320.8	2 077.6	55.2	157.2	91	97
1976 ASM-----	(NA)	(NA)	(NA)	18.9	236.9	13.7	29.6	156.9	733.4	1 169.3	1 894.0	52.1	138.6	(NA)	(NA)
1975 ASM-----	(NA)	(NA)	(NA)	16.6	188.1	12.2	26.4	128.7	636.8	980.0	1 606.4	33.9	121.5	(NA)	(NA)
1974 ASM-----	(NA)	(NA)	(NA)	17.3	184.6	12.8	28.8	129.0	623.3	908.9	1 504.2	35.4	110.6	(NA)	(NA)
1973 ASM-----	(NA)	(NA)	(NA)	16.7	168.9	12.6	28.7	119.1	487.5	651.0	1 146.7	26.8	64.1	(NA)	(NA)
1972 Census ---	117	235	140	15.6	148.7	11.5	26.4	103.2	443.3	573.5	1 010.4	19.6	64.7	93	96
INDUSTRY 2992, LUBRICATING OILS AND GREASES															
1987 Census ---	372	451	163	11.2	311.8	5.5	11.1	124.2	1 143.2	2 629.8	3 765.6	79.5	437.5	95	94
1986 ASM-----	(NA)	(NA)	(NA)	10.4	283.0	5.3	10.7	119.4	991.4	2 339.0	3 355.6	<sup>10</sup> 101.1	350.3	(NA)	(NA)
1985 ASM-----	(NA)	(NA)	(NA)	10.9	298.8	5.4	10.5	115.2	1 046.0	2 433.9	3 483.3	<sup>10</sup> 79.6	383.9	(NA)	(NA)
1984 ASM-----	(NA)	(NA)	(NA)	11.7	309.8	6.1	12.1	130.6	1 072.8	2 561.9	3 595.1	<sup>10</sup> 71.1	404.5	(NA)	(NA)
1983 ASM-----	(NA)	(NA)	(NA)	11.1	261.6	5.5	11.1	101.1	1 116.9	1 744.2	2 821.2	<sup>10</sup> 44.6	579.0	(NA)	(NA)
1982 Census ---	401	473	153	11.9	266.2	5.6	11.3	102.3	902.6	1 949.5	2 875.3	67.8	364.1	94	95
1981 ASM-----	(NA)	(NA)	(NA)	12.8	266.1	6.4	12.5	103.5	851.8	2 257.9	3 086.9	67.7	296.1	(NA)	(NA)
1980 ASM-----	(NA)	(NA)	(NA)	13.3	248.0	6.7	13.4	95.7	799.3	1 979.8	2 751.4	<sup>10</sup> 71.3	267.7	(NA)	(NA)
1979 ASM-----	(NA)	(NA)	(NA)	12.4	216.7	6.2	12.8	92.6	827.7	1 660.8	2 464.0	36.1	219.3	(NA)	(NA)
1978 ASM-----	(NA)	(NA)	(NA)	10.2	169.3	5.4	10.3	72.7	701.3	1 168.8	1 864.6	41.7	179.7	(NA)	(NA)
1977 Census ---	417	490	143	10.3	157.1	5.4	10.4	65.4	524.8	1 101.0	1 644.7	25.6	180.8	94	94
1976 ASM-----	(NA)	(NA)	(NA)	9.9	140.3	5.2	10.5	59.5	469.2	929.8	1 389.1	<sup>10</sup> 28.1	177.2	(NA)	(NA)
1975 ASM-----	(NA)	(NA)	(NA)	9.7	125.9	5.1	10.0	51.7	405.1	773.5	1 175.2	<sup>10</sup> 41.2	150.0	(NA)	(NA)
1974 ASM-----	(NA)	(NA)	(NA)	9.6	113.3	5.1	10.4	48.3	412.6	723.9	1 101.9	<sup>10</sup> 36.6	144.1	(NA)	(NA)
1973 ASM-----	(NA)	(NA)	(NA)	8.3	91.1	4.5	9.1	39.9	285.1	491.1	781.5	10.3	83.4	(NA)	(NA)
1972 Census ---	387	443	117	8.1	83.3	4.4	8.6	36.2	295.8	408.9	703.1	13.7	80.9	94	95
INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C. <sup>9</sup>															
1987 Census ---	92	106	24	1.9	53.6	1.2	2.6	33.9	269.3	440.6	713.1	12.9	96.4	95	94

<sup>1</sup>In annual survey of manufactures (ASM) years, data are estimates based on a representative sample of establishments canvassed annually and may differ from results of a complete canvass of all establishments. ASM publication shows percentage standard errors. Unless otherwise noted, for data prior to 1972, see 1972 Census of Manufactures, vol. II, table 1a of the Industry chapter.

<sup>2</sup>For the Census, a company is defined as a business organization consisting of one establishment or more under common ownership or control.

<sup>3</sup>Includes establishments with payroll at any time during year.

<sup>4</sup>Beginning with the 1982 Census of Manufactures, all respondents were requested to report their inventories at (the lower of) cost or market prior to adjustment to LIFO cost. This is a change from prior Censuses and annual surveys of manufactures in which respondents were permitted to value their inventories using any generally accepted accounting method. Consequently, inventories and value added by manufacture are not comparable to prior-year data.

<sup>5</sup>Detailed data on materials consumed by type are shown in table 7.

<sup>6</sup>Detailed data on new machinery and equipment expenditures are provided in table 3c.

<sup>7</sup>Represents ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for establishments classified in the industry.

<sup>8</sup>Represents ratio of primary products shipped by establishments classified in industry to total shipments of such products by all manufacturing establishments, wherever classified.

<sup>9</sup>Industry definition is new for 1987 Census of Manufactures. An explanation of the Standard Industrial Classification revision appears in the Summary of Findings of this report.

<sup>10</sup>Estimates for new capital expenditures have associated standard error of 15 percent or more and may be of limited reliability. Estimates for other data items are of acceptable reliability.

<sup>11</sup>Data either have associated standard errors exceeding 15 percent or are not consistent with other census series and related data; thus these estimates may be of limited reliability.



Table 1a-2. **Historical Statistics for the Industry (1972 Basis): 1987 and Earlier Years**

[Table 1a-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Companies (no.)	All establishments		All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expend- itures (million dollars)	End-of- year inven- tories (million dollars)	Ratios	
		Total (no.)	With 20 employ- ees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						Spe- cial- ization (per- cent)	Cover- age (per- cent)
INDUSTRY 2911, PETROLEUM REFINING															
1987 Census ---	221	343	248	83.7	3 221.2	55.3	114.9	1 998.0	16 850.8	111 006.0	126 983.2	2 306.1	9 521.6	(NA)	(NA)
1986 ASM -----	(NA)	(NA)	(NA)	84.2	3 131.1	55.2	112.8	1 967.4	13 761.7	95 995.2	113 286.4	2 273.0	8 259.8	(NA)	(NA)
1985 ASM -----	(NA)	(NA)	(NA)	85.7	3 073.0	56.1	119.9	1 923.9	13 659.5	153 095.1	167 501.8	3 037.5	12 853.7	(NA)	(NA)
1984 ASM -----	(NA)	(NA)	(NA)	94.6	3 326.3	61.3	131.9	2 031.0	12 743.3	164 812.7	177 692.3	3 494.4	13 314.6	(NA)	(NA)
1983 ASM -----	(NA)	(NA)	(NA)	103.5	3 440.4	66.7	141.3	2 147.2	17 880.8	163 416.7	182 591.8	4 319.1	13 867.9	(NA)	(NA)
1982 Census ---	282	433	311	108.3	3 397.9	71.0	147.9	2 057.4	19 246.8	178 524.4	199 356.5	6 322.4	16 204.1	99	99
1981 ASM -----	(NA)	(NA)	(NA)	108.8	3 188.1	72.6	151.7	2 008.8	24 149.0	191 350.8	215 056.1	4 942.7	9 686.0	(NA)	(NA)
1980 ASM -----	(NA)	(NA)	(NA)	102.7	2 751.3	69.5	136.8	1 629.9	22 146.9	169 668.8	190 103.1	3 377.6	9 178.8	(NA)	(NA)
1979 ASM -----	(NA)	(NA)	(NA)	108.3	2 562.9	72.8	151.5	1 657.8	26 176.7	116 062.2	140 371.6	3 069.8	7 074.8	(NA)	(NA)
1978 ASM -----	(NA)	(NA)	(NA)	101.7	2 226.7	70.2	147.2	1 485.8	13 707.9	82 842.0	96 806.7	2 070.5	4 963.0	(NA)	(NA)
1977 Census ---	191	349	279	102.5	2 055.3	70.8	144.4	1 366.4	14 423.9	77 854.6	91 688.8	2 108.6	5 196.2	99	98
1976 ASM -----	(NA)	(NA)	(NA)	101.7	1 886.9	70.9	145.4	1 245.9	11 409.6	66 303.0	77 507.3	2 656.1	4 801.8	(NA)	(NA)
1975 ASM -----	(NA)	(NA)	(NA)	101.0	1 665.8	70.2	138.9	1 063.4	8 927.2	56 553.9	65 254.2	2 275.2	4 395.3	(NA)	(NA)
1974 ASM -----	(NA)	(NA)	(NA)	102.9	1 461.8	73.2	146.2	952.8	8 363.5	47 616.9	54 833.8	1 716.3	3 770.1	(NA)	(NA)
1973 ASM -----	(NA)	(NA)	(NA)	98.0	1 303.1	68.6	134.8	845.1	6 518.5	25 606.8	31 845.8	1 012.5	2 365.5	(NA)	(NA)
1972 Census ---	154	323	277	100.8	1 247.1	71.2	142.3	816.3	4 594.7	21 171.3	25 921.1	1 061.6	2 002.2	99	99
INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C.															
1987 Census ---	84	96	19	1.5	44.0	1.0	2.1	28.7	227.2	375.8	605.1	11.3	84.4	(NA)	(NA)
1986 ASM -----	(NA)	(NA)	(NA)	2.1	55.8	1.4	3.0	35.2	247.3	483.3	737.3	11.5	117.9	(NA)	(NA)
1985 ASM -----	(NA)	(NA)	(NA)	1.9	52.9	1.3	2.8	33.1	225.5	443.6	662.4	75.4	119.3	(NA)	(NA)
1984 ASM <sup>11</sup> -----	(NA)	(NA)	(NA)	2.1	56.3	1.5	3.3	35.3	191.3	532.5	719.9	28.5	123.8	(NA)	(NA)
1983 ASM <sup>11</sup> -----	(NA)	(NA)	(NA)	2.2	50.9	1.5	3.1	32.0	148.0	532.4	663.4	115.2	138.3	(NA)	(NA)
1982 Census ---	100	109	27	2.0	45.5	1.4	2.8	28.7	176.4	561.1	738.8	55.6	192.4	94	89
1981 Census ---	(NA)	(NA)	(NA)	1.6	39.7	1.0	1.9	20.3	230.8	655.4	880.1	<sup>10</sup> 21.7	152.0	(NA)	(NA)
1980 ASM -----	(NA)	(NA)	(NA)	1.6	31.6	1.0	1.9	17.3	236.9	457.7	689.2	<sup>10</sup> 42.4	58.8	(NA)	(NA)
1979 ASM -----	(NA)	(NA)	(NA)	1.5	27.8	1.0	2.0	16.7	161.2	420.2	582.5	<sup>10</sup> 34.2	35.9	(NA)	(NA)
1978 ASM -----	(NA)	(NA)	(NA)	1.6	24.2	1.2	2.4	16.4	155.4	322.2	478.0	34.3	67.2	(NA)	(NA)
1977 Census ---	60	70	23	1.6	22.5	1.1	2.1	14.2	157.0	306.9	463.3	14.5	59.3	97	87
1976 ASM -----	(NA)	(NA)	(NA)	1.0	13.1	.8	1.5	9.7	105.9	194.0	305.9	38.2	44.5	(NA)	(NA)
1975 ASM -----	(NA)	(NA)	(NA)	.9	11.3	.7	1.4	8.0	102.1	109.7	211.5	16.3	30.2	(NA)	(NA)
1974 ASM -----	(NA)	(NA)	(NA)	1.1	12.3	.9	1.9	8.6	83.5	118.1	201.9	<sup>10</sup> 8.6	25.0	(NA)	(NA)
1973 ASM -----	(NA)	(NA)	(NA)	1.2	11.2	1.0	1.8	8.0	60.3	98.2	157.5	3.1	31.8	(NA)	(NA)
1972 Census ---	42	51	17	1.1	10.6	.9	1.8	7.5	56.3	81.6	137.6	3.0	36.7	99	91

Note: For qualifications of data, see footnotes on table 1a.

Table 1b-1. **Selected Operating Ratios for the Industry (1987 Basis): 1987 and Earlier Years**

[Industries with only 1987 data are revised for 1987. Table 1b-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
INDUSTRY 2911, PETROLEUM REFINING									
1987 Census-----	38 143	67	2 066	17.40	89	91	190 661	20	137.69
INDUSTRY 2951, ASPHALT PAVING MIXTURES AND BLOCKS									
1987 Census-----	29 459	68	2 090	12.76	63	73	109 788	27	76.69
1986 ASM -----	27 530	72	2 085	11.56	66	76	90 537	30	60.22
1985 ASM -----	25 712	73	2 236	10.07	71	80	79 788	32	49.15
1984 ASM -----	24 881	72	2 194	10.19	70	80	74 479	33	47.46
1983 ASM -----	22 893	71	2 065	10.43	69	80	67 013	34	45.48
1982 Census-----	22 401	73	2 000	10.32	70	81	60 914	37	41.71
1981 ASM -----	20 675	73	1 989	9.32	68	79	58 808	35	40.79
1980 ASM -----	19 817	73	2 054	8.62	68	79	57 762	34	38.51
1979 ASM -----	18 333	75	2 093	8.14	68	79	51 225	36	32.55
1978 ASM -----	18 592	78	2 133	8.04	64	77	55 615	33	33.52
1977 Census-----	14 775	75	2 082	6.65	68	80	39 364	38	25.14
1976 ASM -----	12 364	74	1 938	5.68	64	76	34 946	35	24.24
1975 ASM -----	12 030	75	2 144	5.07	63	76	32 954	37	20.60
1974 ASM -----	10 061	64	2 191	4.96	63	75	31 850	32	22.73
1973 ASM -----	11 427	73	2 121	5.09	59	74	31 331	36	20.13
1972 Census-----	10 625	72	2 140	4.71	57	73	29 000	37	18.84

See footnotes at end of table.

**Table 1b-1. Selected Operating Ratios for the Industry (1987 Basis): 1987 and Earlier Years**

—Con.

[Industries with only 1987 data are revised for 1987. Table 1b-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
<b>INDUSTRY 2952, ASPHALT FELTS AND COATINGS</b>									
1987 Census	26 289	72	2 082	11.75	63	74	95 119	28	63.57
1986 ASM	25 961	71	2 086	11.38	66	75	88 893	29	60.03
1985 ASM	23 034	70	2 040	10.83	71	81	70 535	33	49.31
1984 ASM	22 737	72	2 057	10.25	69	78	74 731	30	50.17
1983 ASM	21 579	73	2 142	9.36	73	82	61 559	35	39.32
1982 Census	20 330	73	2 019	9.29	70	80	57 528	35	38.90
1981 ASM	19 549	73	2 065	8.91	73	85	46 965	42	31.37
1980 ASM	17 887	72	2 142	7.98	70	81	48 374	37	31.52
1979 ASM	16 700	74	2 152	7.22	66	79	45 558	37	28.75
1978 ASM	15 561	75	2 208	6.50	63	75	46 495	33	28.08
1977 Census	13 933	73	2 168	6.00	64	77	39 190	36	24.65
1976 ASM	12 534	72	2 161	5.30	62	74	38 804	32	24.78
1975 ASM	11 331	73	2 164	4.88	61	73	38 361	30	24.12
1974 ASM	10 670	74	2 250	4.48	60	73	36 029	30	21.64
1973 ASM	10 113	75	2 278	4.15	57	72	29 192	35	16.99
1972 Census	9 532	74	2 296	3.91	57	71	28 417	34	16.79
<b>INDUSTRY 2992, LUBRICATING OILS AND GREASES</b>									
1987 Census	27 839	49	2 018	11.19	70	78	102 071	27	102.99
1986 ASM	27 211	51	2 019	11.16	70	78	95 327	29	92.65
1985 ASM	27 412	50	1 944	10.97	70	78	95 963	29	99.62
1984 ASM	26 478	52	1 984	10.79	71	80	91 692	29	88.66
1983 ASM	23 567	50	2 018	9.11	62	71	100 622	23	100.62
1982 Census	22 369	47	2 018	9.05	68	77	75 849	29	79.88
1981 ASM	20 789	50	1 953	8.28	73	82	66 547	31	68.14
1980 ASM	18 646	50	2 000	7.14	72	81	60 098	31	59.65
1979 ASM	17 475	50	2 065	7.23	67	76	66 750	26	64.66
1978 ASM	16 598	53	1 907	7.06	63	72	68 755	24	68.09
1977 Census	15 252	52	1 926	6.29	67	76	50 951	30	50.46
1976 ASM	14 171	53	2 019	5.67	67	77	47 394	30	44.69
1975 ASM	12 979	53	1 961	5.17	66	77	41 763	31	40.51
1974 ASM	11 802	53	2 039	4.64	66	76	42 979	27	39.67
1973 ASM	10 975	54	2 022	4.38	63	74	34 349	32	31.33
1972 Census	10 283	54	1 955	4.21	58	70	36 519	28	34.40
<b>INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C.</b>									
1987 Census	28 211	63	2 167	13.04	62	69	141 737	20	103.58

Note: For qualifications of data, see footnotes on table 1a.

**Table 1b-2. Selected Operating Ratios for the Industry (1972 Basis): 1987 and Earlier Years**

[Table 1b-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
<b>INDUSTRY 2911, PETROLEUM REFINING</b>									
1987 Census	38 485	66	2 078	17.39	87	90	201 324	19	146.66
1986 ASM	37 186	66	2 043	17.44	85	88	163 441	23	122.00
1985 ASM	35 857	65	2 137	16.05	91	93	159 387	22	113.92
1984 ASM	35 161	65	2 152	15.40	93	95	134 707	26	96.61
1983 ASM	33 240	64	2 118	15.20	89	91	172 761	19	126.54
1982 Census	31 374	66	2 083	13.91	90	91	177 717	18	130.13
1981 ASM	29 302	67	2 090	13.24	89	90	221 958	13	159.19
1980 ASM	26 789	68	1 968	11.91	89	91	215 647	12	161.89
1979 ASM	23 664	67	2 081	10.94	83	85	241 705	10	172.78
1978 ASM	21 894	69	2 097	10.09	86	88	134 788	16	93.12
1977 Census	20 051	69	2 040	9.46	85	87	140 721	14	99.89
1976 ASM	18 553	70	2 051	8.57	86	88	112 189	17	78.47
1975 ASM	16 493	70	1 979	7.66	87	89	88 388	19	64.27
1974 ASM	14 206	71	1 997	6.52	87	90	81 278	17	57.21
1973 ASM	13 296	70	1 965	6.27	80	85	66 515	20	48.36
1972 Census	12 372	71	1 999	5.74	82	86	45 582	27	32.29

See footnotes at end of table.



**Table 1b-2. Selected Operating Ratios for the Industry (1972 Basis): 1987 and Earlier Years**  
—Con.

[Table 1b-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
<b>INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C.</b>									
1987 Census.....	29 333	67	2 100	13.67	62	69	151 467	19	108.19
1986 ASM.....	26 571	67	2 143	11.73	66	73	117 762	23	82.43
1985 ASM.....	27 842	68	2 154	11.82	67	75	118 684	23	80.54
1984 ASM.....	26 809	71	2 200	10.70	74	82	91 095	29	57.97
1983 ASM.....	23 136	68	2 067	10.32	80	88	67 273	34	47.74
1982 Census.....	22 750	70	2 000	10.25	76	82	88 200	26	63.00
1981 ASM.....	24 812	63	1 900	10.68	74	79	144 250	17	121.47
1980 ASM.....	19 750	63	1 900	9.11	66	71	148 063	13	124.68
1979 ASM.....	18 533	67	2 000	8.35	72	77	107 467	17	80.60
1978 ASM.....	15 125	75	2 000	6.83	67	72	97 125	16	64.75
1977 Census.....	14 062	69	1 909	6.76	66	71	98 125	14	74.76
1976 ASM.....	13 100	80	1 875	6.47	63	68	105 900	12	70.60
1975 ASM.....	12 555	78	2 000	5.71	52	57	113 444	11	72.93
1974 ASM.....	11 181	82	2 111	4.53	58	65	75 909	15	43.95
1973 ASM.....	9 333	83	1 800	4.44	62	69	50 250	19	33.50
1972 Census.....	9 636	82	2 000	4.17	59	67	51 182	19	31.28

Note: For qualifications of data, see footnotes on table 1a.

**Table 1c-1. 1987 Statistics for the Industry Showing the Distribution of 1987 SIC-Based Industries Among 1972 SIC-Based Industries**

[Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
		Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
New Industry 2911, Petroleum Refining.....	309	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4	8 795.0
Old Industry 2911, Petroleum Refining.....	309	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4	8 795.0
New Industry 2999, Petroleum and Coal Products, N.E.C. ....	106	1.9	53.6	1.2	2.6	33.9	269.3	440.6	713.1	12.9	96.4
Old Industry 2999, Petroleum and Coal Products, N.E.C. ....	96	1.5	44.0	1.0	2.1	28.7	227.2	375.8	605.1	11.3	84.4
Old Industry 2911, Petroleum Refining.....	10	.4	9.6	.3	.5	5.2	42.1	64.9	108.0	1.6	11.9

Note: For qualifications of data, see footnotes on table 1a.

**Table 1c-2. 1987 Statistics for the Industry Showing the Distribution of 1972 SIC-Based Industries Among 1987 SIC-Based Industries**

[Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
		Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
Old Industry 2911, Petroleum Refining.....	343	83.7	3 221.2	55.3	114.9	1 998.0	16 850.8	111 006.0	126 983.2	2 306.1	9 521.6
New Industry 2865, Cyclic Crudes and Intermediates.....	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
New Industry 2869, Industrial Organic Chemicals, N.E.C. ....	22	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
New Industry 2911, Petroleum Refining.....	309	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4	8 795.0
New Industry 2999, Petroleum and Coal Products, N.E.C. ....	10	.4	9.6	.3	.5	5.2	42.1	64.9	108.0	1.6	11.9
Old Industry 2999, Petroleum and Coal Products, N.E.C. ....	96	1.5	44.0	1.0	2.1	28.7	227.2	375.8	605.1	11.3	84.4
New Industry 2999, Petroleum and Coal Products, N.E.C. ....	96	1.5	44.0	1.0	2.1	28.7	227.2	375.8	605.1	11.3	84.4

Note: For qualifications of data, see footnotes on table 1a.

**Table 2. Industry Statistics for Selected States: 1987 and 1982**

[Excludes data for auxiliaries. States with 150 employees or more are shown. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	1987											1982		
	E¹	All establishments		All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	All employees² (1,000)	Value added by manufacture (million dollars)
		Total (no.)	With 20 employees or more (no.)	Number² (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						
INDUSTRY 2911, PETROLEUM REFINING														
United States -----	-	309	221	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4	(NA)	(NA)
Alabama -----	E1	6	5	.5	17.8	.3	.8	11.3	63.0	768.6	829.6	3.7	(NA)	(NA)
Alaska -----	-	5	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Arkansas -----	-	6	4	.7	19.0	.4	.7	10.1	57.7	448.5	498.8	(D)	(NA)	(NA)
California -----	-	40	31	11.6	460.3	7.3	14.8	272.4	2 393.1	13 436.8	15 639.2	584.3	(NA)	(NA)
Colorado -----	-	6	4	.3	10.4	.2	.5	7.4	43.0	513.8	563.5	(D)	(NA)	(NA)
Delaware -----	-	1	1	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Hawaii -----	-	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Illinois -----	E1	9	7	4.3	167.3	3.0	6.2	108.4	362.1	6 128.0	6 457.7	106.7	(NA)	(NA)
Indiana -----	-	8	4	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Kansas -----	-	11	8	2.0	69.8	1.5	2.6	49.8	335.5	2 462.1	2 771.4	(D)	(NA)	(NA)
Kentucky -----	-	3	3	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Louisiana -----	-	26	22	8.5	338.4	5.4	11.3	200.7	1 602.3	15 917.1	17 500.0	219.6	(NA)	(NA)
Michigan -----	-	5	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Minnesota -----	-	3	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Mississippi -----	-	8	5	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Montana -----	-	5	4	.8	26.2	.5	1.1	17.0	47.4	853.6	892.0	(D)	(NA)	(NA)
New Jersey -----	-	5	5	2.2	91.6	1.4	3.1	56.4	292.3	3 572.5	3 854.5	37.6	(NA)	(NA)
New Mexico -----	E2	4	3	.5	19.7	.2	.5	8.7	102.4	520.3	623.2	(D)	(NA)	(NA)
North Dakota -----	-	1	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Ohio -----	-	8	6	1.9	71.1	1.2	2.9	46.7	167.5	3 533.8	3 681.7	(D)	(NA)	(NA)
Oklahoma -----	-	12	7	2.0	69.8	1.5	3.0	48.6	226.9	2 671.1	2 882.9	54.3	(NA)	(NA)
Pennsylvania -----	-	19	16	4.8	167.5	3.1	6.5	108.4	948.2	5 763.7	6 640.3	113.3	(NA)	(NA)
Tennessee -----	-	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Texas -----	-	59	39	21.8	848.6	15.0	31.3	544.8	4 544.0	30 061.0	34 470.4	447.7	(NA)	(NA)
Utah -----	E1	9	7	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Virginia -----	-	2	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Washington -----	-	8	5	1.5	61.5	1.0	2.0	36.2	567.3	2 950.6	3 498.7	(D)	(NA)	(NA)
West Virginia -----	-	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Wisconsin -----	E1	4	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Wyoming -----	-	9	6	.9	30.5	.6	1.4	21.7	53.3	977.4	1 017.0	(D)	(NA)	(NA)
INDUSTRY 2951, ASPHALT PAVING MIXTURES AND BLOCKS														
United States -----	E1	1 101	199	14.6	430.1	10.0	20.9	266.7	1 602.9	2 758.2	4 346.2	123.4	15.2	925.9
Alabama -----	-	16	6	.3	8.4	.2	.4	3.4	67.6	71.5	138.4	1.3	CC	(D)
Arizona -----	E1	12	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Arkansas -----	E2	10	4	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
California -----	E1	112	16	1.2	49.8	.7	1.6	28.6	179.2	343.5	521.9	(D)	1.2	98.1
Colorado -----	-	12	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Connecticut -----	-	23	4	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.5	45.1
Florida -----	E1	26	10	.7	17.7	.3	.8	7.1	43.8	80.6	124.1	(D)	.8	32.2
Georgia -----	E1	37	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.2	13.1
Illinois -----	E2	30	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.3	22.6
Indiana -----	E3	28	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.5	26.9
Kentucky -----	E1	27	4	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Maine -----	-	10	5	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.3	21.2
Maryland -----	E1	21	1	.2	7.0	.1	.3	3.1	36.6	57.1	93.7	(D)	.5	25.3
Massachusetts -----	E2	43	10	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.6	48.7
Minnesota -----	-	16	6	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.2	12.2
Missouri -----	E3	30	7	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
New Hampshire -----	E2	7	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Jersey -----	E1	33	8	.6	18.7	.4	.7	10.7	69.8	90.3	160.5	6.5	.7	47.6
New York -----	E2	127	29	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
Ohio -----	E2	119	16	1.2	29.1	.8	1.6	19.7	119.3	262.2	375.4	(D)	1.0	53.2
Oklahoma -----	E2	18	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.2	11.8
Oregon -----	E4	9	3	.2	6.0	.1	.3	3.7	13.3	20.0	33.3	(D)	.2	7.7
Pennsylvania -----	E2	93	12	.9	22.5	.6	1.4	15.0	90.2	162.9	252.6	8.4	1.2	55.4
Tennessee -----	E2	33	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.4	20.9
Texas -----	E1	37	11	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.4	34.0
Virginia -----	E2	12	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Washington -----	-	10	4	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.1	47.8
INDUSTRY 2952, ASPHALT FELTS AND COATINGS														
United States -----	-	266	145	13.5	354.9	9.7	20.2	237.3	1 284.1	2 147.2	3 402.9	89.8	14.2	816.9
Alabama -----	-	9	6	.8	22.8	.6	1.4	16.1	66.0	124.9	190.4	7.1	.6	34.6
Arkansas -----	E1	5	4	.2	4.3	.2	.3	2.7	11.6	22.2	34.3	.3	CC	(D)
California -----	-	30	16	1.1	32.4	.8	1.7	22.6	121.8	215.8	335.8	(D)	1.4	82.0
Florida -----	-	15	7	.4	11.3	.3	.7	7.8	48.6	94.5	142.4	(D)	.4	42.0
Georgia -----	-	10	8	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.6	43.2
Illinois -----	-	18	10	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.2	46.4
Indiana -----	-	7	4	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.3	25.9
Kansas -----	-	3	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Louisiana -----	E1	4	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Maryland -----	-	5	3	.5	13.6	.4	.8	10.8	82.3	79.4	157.2	(D)	.3	12.7

See footnotes at end of table.



**Table 2. Industry Statistics for Selected States: 1987 and 1982—Con.**

[Excludes data for auxiliaries. States with 150 employees or more are shown. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	1987												1982	
	E <sup>1</sup>	All establishments		All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	All employees <sup>2</sup> (1,000)	Value added by manufacture (million dollars)
		Total (no.)	With 20 employees or more (no.)	Number <sup>2</sup> (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						
<b>INDUSTRY 2952, ASPHALT FELTS AND COATINGS—Con.</b>														
Massachusetts .....	—	4	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Minnesota .....	E1	5	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.3	26.0
Missouri .....	—	5	2	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
New Jersey .....	E2	13	6	.5	15.3	.4	.6	8.2	55.7	101.8	156.1	1.3	1.1	48.0
New York .....	E2	11	4	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
North Carolina .....	—	8	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.3	16.9
Ohio .....	—	27	16	1.4	39.0	.9	1.8	20.2	150.0	203.2	348.6	(D)	1.2	98.2
Oklahoma .....	—	4	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.4	13.5
Oregon .....	E1	6	4	.3	6.9	.2	.4	5.0	26.1	41.4	65.1	(D)	.3	21.2
Pennsylvania .....	E1	14	6	.6	15.8	.4	.8	9.3	39.7	89.8	128.6	11.6	.4	35.8
South Carolina .....	—	4	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.4	20.3
Tennessee .....	E2	5	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Texas .....	—	25	18	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.6	113.2
<b>INDUSTRY 2992, LUBRICATING OILS AND GREASES</b>														
United States .....	E1	451	163	11.2	311.8	5.5	11.1	124.2	1 143.2	2 629.8	3 765.6	79.5	11.9	902.6
California .....	—	45	18	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.3	107.8
Georgia .....	E1	9	4	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.2	8.7
Illinois .....	E1	45	20	1.2	33.6	.6	1.1	13.0	129.9	323.6	450.5	6.6	1.2	71.1
Indiana .....	E1	9	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Kansas .....	E2	10	7	.4	9.7	.3	.6	5.3	27.5	82.7	110.9	1.9	CC	(D)
Louisiana .....	—	15	7	.6	14.6	.4	.8	8.6	24.0	327.2	354.3	4.6	.6	113.8
Maryland .....	—	6	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Massachusetts .....	—	7	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Michigan .....	E1	38	12	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Minnesota .....	—	9	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Missouri .....	E1	10	6	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
New Jersey .....	—	22	9	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
New York .....	E1	15	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Ohio .....	E2	37	15	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Oklahoma .....	—	10	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Pennsylvania .....	E1	36	20	1.2	36.6	.6	1.2	14.4	116.5	230.0	345.8	10.0	EE	(D)
Texas .....	E3	49	5	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
West Virginia .....	E9	2	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
<b>INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C.</b>														
United States .....	E1	106	24	1.9	53.6	1.2	2.6	33.9	269.3	440.6	713.1	12.9	(NA)	(NA)
California .....	E1	13	4	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Illinois .....	—	7	3	.2	5.4	.1	.2	3.3	32.8	42.9	78.1	1.1	(NA)	(NA)
Louisiana .....	—	8	4	.2	8.3	.2	.3	5.1	40.5	66.4	111.5	2.4	(NA)	(NA)
Oklahoma .....	—	5	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Texas .....	—	14	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)

Note: For qualifications of data, see footnotes on table 1a.

<sup>1</sup>Payroll and sales data for some small single-unit companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other Government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate the items shown for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown for those States where estimated value of shipments data based on administrative-record data account for 10 percent or more of figure shown: E1—10 to 19 percent; E2—20 to 29 percent; E3—30 to 39 percent; E4—40 to 49 percent; E5—50 to 59 percent; E6—60 to 69 percent; E7—70 to 79 percent; E8—80 to 89 percent; E9—90 percent or more.

<sup>2</sup>Statistics for some producing States have been withheld to avoid disclosing data for individual companies. However, for States with 150 employees or more, number of establishments is shown and employment-size range is indicated by one of the following symbols: AA—150 to 249 employees; BB—250 to 499 employees; CC—500 to 999 employees; EE—1,000 to 2,499 employees; FF—2,500 employees or more.

**Table 3a. Summary Statistics for the Industry: 1987**

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Petroleum refining (SIC 2911)	Asphalt paving mixtures and blocks (SIC 2951)	Asphalt felts and coatings (SIC 2952)	Lubricating oils and greases (SIC 2992)	Petroleum and coal products, n.e.c. (SIC 2999)
Companies ----- number ..	201	542	162	372	92
All establishments ----- do ..	309	1 101	266	451	106
With 1 to 19 employees ----- do ..	88	902	121	288	82
With 20 to 99 employees ----- do ..	80	188	90	143	22
With 100 employees or more ----- do ..	141	11	55	20	2
Employment and labor costs:					
Employees ----- 1,000 ..	74.6	14.6	13.5	11.2	1.9
Compensation, total ----- mil dol ..	3 467.2	543.8	433.8	368.6	67.5
Annual payroll ----- do ..	2 845.5	430.1	354.9	311.8	53.6
Fringe benefits ----- do ..	621.7	113.7	78.9	56.8	13.9
Social Security and other legally required payments ----- do ..	226.8	57.4	37.7	26.6	5.8
Employer payments and other programs ----- do ..	394.9	56.3	41.2	30.2	8.1
Production workers:					
Average for year ----- 1,000 ..	50.0	10.0	9.7	5.5	1.2
March ----- do ..	49.9	8.1	9.6	5.4	1.3
May ----- do ..	50.1	10.2	9.7	5.4	1.2
August ----- do ..	50.2	11.0	10.1	5.5	1.2
November ----- do ..	49.7	10.2	9.3	5.6	1.2
Hours ----- millions ..	103.3	20.9	20.2	11.1	2.6
January to March ----- do ..	25.8	3.9	4.8	2.7	.7
April to June ----- do ..	25.9	5.4	5.1	2.7	.7
July to September ----- do ..	25.7	6.2	5.4	2.8	.6
October to December ----- do ..	25.9	5.3	4.9	2.8	.6
Wages ----- mil dol ..	1 797.1	266.7	237.3	124.2	33.9
Value added by manufacture ----- do ..	14 223.3	1 602.9	1 284.1	1 143.2	269.3
Cost of materials <sup>1</sup> ----- do ..	104 826.4	2 758.2	2 147.2	2 629.8	440.6
Materials, parts, containers, etc., consumed <sup>2</sup> ----- do ..	98 513.8	2 428.0	1 932.0	2 422.1	385.6
Resales ----- do ..	2 574.9	48.1	122.2	134.4	20.9
Fuels ----- do ..	1 781.6	141.8	49.6	18.9	12.4
Purchased electricity ----- do ..	1 407.0	58.5	32.7	15.0	11.1
Contract work ----- do ..	549.0	81.8	10.7	39.3	10.6
Quantity of electric energy used for heat and power:					
Purchased ----- mil kWh ..	31 315.6	995.3	630.3	247.8	265.4
Generated less sold ----- do ..	6 610.6	(D)	(D)	-	(D)
Total value of shipments ----- mil dol ..	118 216.1	4 346.2	3 402.9	3 765.6	713.1
Primary products ----- do ..	114 132.5	3 846.1	3 135.0	3 388.3	612.1
Secondary products ----- do ..	894.1	248.8	112.7	172.4	28.8
Miscellaneous receipts, total ----- do ..	3 189.5	251.3	155.2	204.8	72.2
Value of resales ----- do ..	2 621.3	62.0	151.6	170.5	23.2
Contract receipts ----- do ..	403.5	30.7	(D)	26.8	(D)
Other miscellaneous receipts ----- do ..	164.7	<sup>3</sup> 158.6	(D)	7.5	(D)
Inventories by stage of fabrication:					
Beginning of 1987 ----- mil dol ..	7 707.7	186.5	231.9	418.7	101.1
Finished goods ----- do ..	3 808.4	73.6	130.9	239.8	39.0
Work in process ----- do ..	1 991.5	16.0	8.7	24.5	8.5
Materials and supplies ----- do ..	1 907.8	96.9	92.3	154.4	53.5
End of 1987 ----- do ..	8 795.0	203.9	266.4	437.5	96.4
Finished goods ----- do ..	4 442.4	88.1	158.5	249.0	33.7
Work in process ----- do ..	2 191.1	16.4	9.4	22.7	10.6
Materials and supplies ----- do ..	2 161.6	99.5	98.4	165.7	52.0
Primary product specialization ratio ----- percent ..	99	94	97	95	95
Coverage ratio ----- do ..	99	94	99	94	94

Note: For qualifications of data, see footnotes on table 1a.

<sup>1</sup>Data on purchased services for the repair of buildings and machinery and for communication services are not included in cost of materials, etc., but are shown in table 3c.

<sup>2</sup>Data on materials consumed by type are shown in table 7. Data on amount purchased or transferred from foreign sources are shown in table 3c.

<sup>3</sup>Includes \$134.4 million of receipts for construction work (paving, etc.).

**Table 3b. Gross Book Value of Depreciable Assets, Capital Expenditures, Retirements, Depreciation, and Rental Payments: 1987**

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Petroleum refining (SIC 2911)	Asphalt paving mixtures and blocks (SIC 2951)	Asphalt felts and coatings (SIC 2952)	Lubricating oils and greases (SIC 2992)	Petroleum and coal products, n.e.c. (SIC 2999)
Gross book value of depreciable assets:					
Total:					
Beginning of year -----	44 711.4	1 464.0	922.8	805.3	710.0
New capital expenditures <sup>1</sup> -----	2 035.4	123.4	89.8	79.5	12.9
Used capital expenditures -----	68.4	22.0	11.2	4.3	.6
Retirements -----	1 485.1	41.9	33.8	12.9	50.1
End of year -----	45 330.1	1 567.5	990.0	876.2	673.4
Buildings and other structures:					
Beginning of year -----	14 299.8	134.6	220.8	222.7	98.0
New capital expenditures -----	517.0	12.1	15.1	12.5	1.4
Used capital expenditures -----	42.7	6.0	2.1	1.4	.2
Retirements -----	178.4	2.3	3.9	1.7	10.4
End of year -----	14 681.1	150.4	234.1	234.9	89.2
Machinery and equipment:					
Beginning of year -----	30 411.6	1 329.2	702.0	582.5	612.0
New capital expenditures <sup>1</sup> -----	1 518.4	111.3	74.7	67.0	11.5
Used capital expenditures -----	25.7	16.0	9.1	2.9	.4
Retirements -----	1 306.7	39.8	29.9	11.2	39.7
End of year -----	30 649.0	1 417.0	755.9	641.2	584.1

See footnotes at end of table.



**Table 3b. Gross Book Value of Depreciable Assets, Capital Expenditures, Retirements, Depreciation, and Rental Payments: 1987—Con.**

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Petroleum refining (SIC 2911)	Asphalt paving mixtures and blocks (SIC 2951)	Asphalt felts and coatings (SIC 2952)	Lubricating oils and greases (SIC 2992)	Petroleum and coal products, n.e.c. (SIC 2999)
Depreciation charges during 1987:					
Total .....	1 916.8	126.9	69.8	53.1	36.4
Buildings and other structures .....	613.9	9.3	10.5	8.9	3.8
Machinery and equipment .....	1 302.9	117.5	59.3	44.2	32.6
Rental payments:					
Total .....	294.8	27.8	9.7	17.7	1.9
Buildings and other structures .....	88.7	8.7	2.9	8.9	.7
Machinery and equipment .....	206.1	19.1	6.8	8.8	1.1

Note: Retirements and depreciation data for establishments not included in the ASM sample were extrapolated from the historical ratio of retirements or depreciation to assets. These ratios were developed at the industry level.

<sup>1</sup>Data on new machinery and equipment expenditures by type are provided in table 3c.

**Table 3c. Supplemental Industry Statistics Based on Sample Estimates: 1987**

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Petroleum refining (SIC 2911)		Asphalt paving mixtures and blocks (SIC 2951)		Asphalt felts and coatings (SIC 2952)		Lubricating oils and greases (SIC 2992)		Petroleum and coal products, n.e.c. (SIC 2999)	
	Amount (million dollars)	Relative standard error of estimate <sup>1</sup> (percent)	Amount (million dollars)	Relative standard error of estimate <sup>1</sup> (percent)	Amount (million dollars)	Relative standard error of estimate <sup>1</sup> (percent)	Amount (million dollars)	Relative standard error of estimate <sup>1</sup> (percent)	Amount (million dollars)	Relative standard error of estimate <sup>1</sup> (percent)
Purchased services:										
Cost of purchased services for the repair of—										
Buildings and other structures .....	673.4	(X)	(S)	(X)	2.2	(X)	6.1	(X)	.9	(X)
Response coverage ratio (percent) <sup>2</sup> .....	81.4	(X)	(S)	(X)	66.6	(X)	60.3	(X)	54.0	(X)
Machinery .....	748.7	(X)	(S)	(X)	26.8	(X)	10.2	(X)	9.6	(X)
Response coverage ratio (percent) <sup>2</sup> .....	70.3	(X)	(S)	(X)	74.1	(X)	62.3	(X)	64.3	(X)
Cost of purchased communication services .....	78.8	(X)	(S)	(X)	5.0	(X)	4.3	(X)	.4	(X)
Response coverage ratio (percent) <sup>2</sup> .....	79.3	(X)	(S)	(X)	74.3	(X)	64.6	(X)	60.0	(X)
New machinery and equipment expenditures .....	1 518.4	(X)	111.3	(X)	74.7	(X)	67.0	(X)	11.5	(X)
Automobiles, trucks, etc., for highway use .....	17.4	1	16.3	17	1.3	22	1.7	42	.3	41
Computers and peripheral data processing equipment .....	31.3	1	10.3	68	.7	28	4.1	6	.3	17
All other .....	1 469.8	1	84.7	8	72.7	1	61.3	2	11.0	2
Adjustment ratio <sup>3</sup> .....	1.2	(X)	1.6	(X)	1.5	(X)	1.0	(X)	1.5	(X)
Cost of materials, components, parts, etc., used .....	98 513.8	(X)	2 428.0	(X)	1 932.0	(X)	2 422.1	(X)	385.6	(X)
Materials purchased or transferred from foreign sources <sup>4</sup> .....	27 810.0	1	52.9	20	109.1	5	8.2	14	—	1
Materials purchased or transferred from domestic sources .....	70 703.9	1	2 375.1	1	1 822.9	1	2 413.9	1	385.6	1
Adjustment ratio <sup>3</sup> .....	1.2	(X)	1.9	(X)	1.4	(X)	1.5	(X)	1.4	(X)

<sup>1</sup>For description of relative standard error of estimate, see Qualifications of the Data in appendixes.

<sup>2</sup>Measure of extent to which respondents reported each item. Derived for each item by calculating the ratio of weighted employment for those sample establishments that reported the specific inquiry to total employment for all establishments classified in industry. (See appendixes for explanation of sample weight.)

<sup>3</sup>Detail has been adjusted upwards to account for nonresponse. Inverse of the ratio shown represents a measure of the response to the inquiry. (See appendixes for further explanation.)

<sup>4</sup>Data may understate the true cost of imported parts, components, and supplies since some respondents do not know the origin of these materials. Includes cases where materials were purchased from secondary suppliers or where they were transferred from company-operated warehouses or other distribution points. Direct purchases from foreign suppliers and importers by domestic manufacturing establishments are believed to be reported accurately.

**Table 4. Industry Statistics by Employment Size of Establishment: 1987**

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and employment size class	E <sup>1</sup>	All estab- lish- ments (no.)	All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expend- itures (million dollars)	End-of- year invento- ries (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
INDUSTRY 2911, PETROLEUM REFINING												
Total -----	-	309	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4	8 795.0
Establishments with an average of—												
1 to 4 employees -----	E9	46	.1	2.1	(Z)	.1	1.1	12.0	70.1	82.3	2.0	5.7
5 to 9 employees -----	E7	22	.2	4.4	.1	.2	2.8	36.9	187.5	225.1	5.4	15.9
10 to 19 employees -----	E7	20	.3	8.3	.2	.3	5.1	61.8	258.0	314.7	3.5	24.9
20 to 49 employees -----	E4	53	1.6	46.3	1.0	2.1	25.7	281.8	1 793.2	2 069.7	18.0	148.4
50 to 99 employees -----	E2	27	2.0	68.1	1.3	2.6	41.4	315.1	1 934.3	2 240.0	35.8	171.4
100 to 249 employees -----	-	51	9.1	328.2	6.4	13.2	216.9	1 436.8	12 269.9	13 639.3	233.0	1 095.8
250 to 499 employees -----	-	43	15.0	559.2	9.6	21.0	350.1	2 457.0	24 644.9	26 805.4	337.4	2 332.5
500 to 999 employees -----	-	31	21.4	825.5	14.7	29.8	533.0	3 959.1	31 513.1	35 304.0	794.9	2 451.0
1,000 to 2,499 employees -----	-	16	25.1	1 003.4	16.8	33.9	621.1	5 662.8	32 155.5	37 535.6	605.4	2 549.5

See footnotes at end of table.

Table 4. Industry Statistics by Employment Size of Establishment: 1987—Con.

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and employment size class	E <sup>1</sup>	All establishments (no.)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
INDUSTRY 2951, ASPHALT PAVING MIXTURES AND BLOCKS												
Total -----	E1	1 101	14.6	430.1	10.0	20.9	266.7	1 602.9	2 758.2	4 346.2	123.4	203.9
Establishments with an average of—												
1 to 4 employees -----	E1	433	1.2	34.7	.9	1.9	25.4	237.2	473.7	708.9	16.3	27.7
5 to 9 employees -----	E1	321	2.1	60.7	1.5	3.2	41.6	364.4	736.6	1 094.6	18.3	51.6
10 to 19 employees -----	E1	148	2.0	57.8	1.5	3.1	39.5	253.6	456.5	707.8	18.9	30.3
20 to 49 employees -----	E2	140	4.3	128.8	2.8	6.0	74.2	421.3	676.6	1 092.8	32.0	48.7
50 to 99 employees -----	E1	48	3.2	89.7	2.1	4.4	53.5	179.4	292.5	472.1	20.8	32.3
100 to 249 employees -----	E1	10	1.8	58.2	1.1	2.2	32.5	146.8	122.4	270.0	17.0	13.2
250 to 499 employees -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records <sup>2</sup> -----	E9	109	.5	10.0	.3	.6	6.4	43.5	77.1	120.6	1.8	4.1
INDUSTRY 2952, ASPHALT FELTS AND COATINGS												
Total -----	-	266	13.5	354.9	9.7	20.2	237.3	1 284.1	2 147.2	3 402.9	89.8	266.4
Establishments with an average of—												
1 to 4 employees -----	E6	51	.1	2.5	.1	.2	1.6	13.4	17.4	30.9	1.6	1.9
5 to 9 employees -----	E5	35	.3	5.7	.2	.3	3.7	21.9	44.4	66.7	1.2	4.6
10 to 19 employees -----	E5	35	.5	11.2	.3	.7	6.8	48.1	86.3	134.3	3.1	10.9
20 to 49 employees -----	E2	56	1.7	37.5	1.2	2.2	20.9	129.6	246.2	375.3	14.6	27.9
50 to 99 employees -----	E1	34	2.5	64.7	1.9	3.8	43.3	255.0	397.0	645.3	14.9	57.9
100 to 249 employees -----	-	53	8.4	233.3	6.1	13.0	161.0	816.1	1 356.0	2 150.3	54.5	163.1
250 to 499 employees -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
500 to 999 employees -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records <sup>2</sup> -----	E9	72	.4	9.2	.3	.6	5.9	33.5	62.3	95.9	2.0	6.8
INDUSTRY 2992, LUBRICATING OILS AND GREASES												
Total -----	E1	451	11.2	311.8	5.5	11.1	124.2	1 143.2	2 629.8	3 765.6	79.5	437.5
Establishments with an average of—												
1 to 4 employees -----	E5	124	.3	5.2	.1	.2	2.4	19.2	97.0	121.1	3.7	12.6
5 to 9 employees -----	E5	86	.6	13.1	.3	.5	5.3	57.6	113.0	170.4	2.0	16.6
10 to 19 employees -----	E3	78	1.0	27.0	.5	1.0	10.9	132.8	240.2	373.6	4.7	40.0
20 to 49 employees -----	E1	98	3.1	84.8	1.5	3.0	36.1	398.1	919.2	1 306.0	20.0	141.7
50 to 99 employees -----	-	45	3.1	94.1	1.6	3.2	36.9	280.8	742.8	1 019.7	22.1	131.7
100 to 249 employees -----	-	18	3.2	87.7	1.4	3.0	32.6	254.7	517.6	774.7	27.0	95.0
250 to 499 employees -----	-	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records <sup>2</sup> -----	E9	99	.3	5.6	.1	.3	2.2	19.3	43.5	62.8	.9	6.0
INDUSTRY 2999, PETROLEUM AND COAL PRODUCTS, N.E.C.												
Total -----	E1	106	1.9	53.6	1.2	2.6	33.9	269.3	440.6	713.1	12.9	96.4
Establishments with an average of—												
1 to 4 employees -----	E7	43	.1	1.6	.1	.1	1.0	6.5	17.3	23.8	.4	2.5
5 to 9 employees -----	E4	24	.2	3.9	.1	.2	2.5	15.1	38.8	54.7	.7	5.5
10 to 19 employees -----	E5	15	.2	3.7	.1	.2	2.0	21.3	32.4	53.9	.7	5.2
20 to 49 employees -----	E1	9	.3	9.9	.2	.5	6.1	36.2	86.8	125.0	.9	15.3
50 to 99 employees -----	-	13	1.1	34.6	.7	1.5	22.3	190.2	265.2	455.8	10.2	67.9
100 to 249 employees -----	-	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records <sup>2</sup> -----	E9	48	.2	4.5	.2	.3	2.9	20.0	44.5	64.5	1.0	6.1

Note: For qualifications of data, see footnotes on table 1a. Data shown as a (D) are included in underscored figures above.

<sup>1</sup>Payroll and sales data for some small single unit companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other Government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate the items shown for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown for those employment-size classes where estimated data based on administrative-record data account for 10 percent or more of figures shown: E1—10 to 19 percent; E2—20 to 29 percent; E3—30 to 39 percent; E4—40 to 49 percent; E5—50 to 59 percent; E6—60 to 69 percent; E7—70 to 79 percent; E8—80 to 89 percent; E9—90 percent or more.

<sup>2</sup>Report forms were not mailed to small single unit companies with up to 20 employees (cutoff varied by industry). Payroll and sales data for 1987 were obtained from administrative records supplied by other agencies of the Federal Government. Those data were then used in conjunction with industry averages to estimate the items shown. Data are also included in respective employment-size classes shown.



Table 5a. Industry Statistics by Industry and Primary Product Class Specialization: 1987

[Table presents selected statistics for establishments according to their degree of specialization in products primary to their industry. Measures of plant specialization shown are (1) industry specialization: ratio of primary product shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment; and (2) product class specialization: ratio of largest primary product class shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment. See appendix for method of computing ratios. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry or product class code	Industry or primary product class	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)				
2911	<b>Petroleum refining:</b> All establishments in industry -----	309	74.6	2 845.5	50.0	103.3	1 797.1	14 223.3	104 826.4	118 216.1	2 035.4
	Establishments with this product class primary:										
29111	Gasoline -----	133	65.9	2 565.4	44.5	91.8	1 622.9	12 955.7	97 662.5	109 826.7	1 904.1
29112	Jet fuel -----	8	.8	26.2	.4	.8	12.5	199.2	1 176.6	1 376.0	21.2
29113	Kerosene -----	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
29114	Light fuel oils -----	15	.8	27.8	.5	1.0	14.7	71.7	563.0	620.4	5.1
29115	Heavy fuel oils -----	7	.6	23.0	.3	.6	10.7	213.2	1 062.0	1 269.0	10.3
29117	Lubricating oils and greases, made in a refinery (see also code 29920) -----	5	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
29118	Unfinished oils and lubricating oil base stock -----	12	1.9	58.7	1.5	3.0	44.7	228.2	885.1	1 096.8	18.7
29119	Asphalt -----	21	1.1	39.2	.8	1.6	23.0	175.8	1 167.0	1 324.1	8.1
2911A	Liquefied refinery gases made in a refinery (see also code 28691) -----	4	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
2911D	Other finished petroleum products, including waxes-----	4	.5	17.2	.4	.7	11.2	62.6	124.5	187.1	(D)
2951	<b>Asphalt paving mixtures and blocks:</b> All establishments in industry -----	1 101	14.6	430.1	10.0	20.9	266.7	1 602.9	2 758.2	4 346.2	123.4
2952	<b>Asphalt felts and coatings:</b> All establishments in industry -----	266	13.5	354.9	9.7	20.2	237.3	1 284.1	2 147.2	3 402.9	89.8
	Establishments with this product class primary:										
29521	Asphalt and tar saturated felts and boards for nonbuilding use -----	8	(Z)	1.2	(Z)	.1	.8	5.2	15.7	21.2	1.2
29522	Roofing asphalts and pitches, coatings, and cements -----	45	1.6	41.6	1.0	1.8	19.6	158.5	234.9	393.8	17.1
29523	Prepared asphalt and tar roofing and siding products -----	99	10.4	281.2	7.7	16.4	197.0	1 014.7	1 701.4	2 686.4	63.4
2992	<b>Lubricating oils and greases:</b> All establishments in industry -----	451	11.2	311.8	5.5	11.1	124.2	1 143.2	2 629.8	3 765.6	79.5
2999	<b>Petroleum and coal products, n.e.c.:</b> All establishments in industry -----	106	1.9	53.6	1.2	2.6	33.9	269.3	440.6	713.1	12.9

Note: For qualifications of data, see footnotes on table 1a.

Table 5b. Industry-Product Analysis—Value of Shipments and Primary Product Shipments and Specialization and Coverage Ratios for the Industry: 1987 and Earlier Census Years

[An establishment is assigned to an industry based on shipment values of products representing largest amount considered primary to an industry. Frequently, establishment shipments comprise mixtures of products assigned to an industry (primary), those considered primary to other industries (secondary), and receipts for activities such as merchandising or contract work. Columns A-D show this product pattern for an industry, and column E shows primary product specialization ratio. The extent to which an industry's primary products are shipped by establishments classified in and out of an industry is shown in columns F-H and coverage ratio is shown in column I. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and product group code	Industry and census year	Value of shipments					Value of primary product shipments			
		Total (million dollars)	Primary products (million dollars)	Secondary products (million dollars)	Miscellaneous receipts (million dollars)	Primary product specialization ratio col. B ÷ col. B+C (percent)	Total made in all industries (million dollars)	Made in this industry (million dollars)	Made in other industries (million dollars)	Coverage ratio col. B ÷ col. F (percent)
		A	B	C	D	E	F	G	H	I
2911	Petroleum refining ----- 1987--	118 216.1	114 132.5	894.1	3 189.5	99	114 307.2	114 132.5	174.7	99
2951	Asphalt paving mixtures and blocks ----- 1987--	4 346.2	3 846.1	248.8	251.3	94	4 087.0	3 846.1	240.9	94
	----- 1982--	3 098.6	2 757.1	216.3	125.2	93	2 881.0	2 757.1	123.8	96
	----- 1977--	1 578.3	1 409.1	80.8	88.4	95	1 518.6	1 409.1	109.5	93
2952	Asphalt felts and coatings ----- 1987--	3 402.9	3 135.0	112.7	155.2	97	3 174.1	3 135.0	39.1	99
	----- 1982--	2 849.5	2 580.5	126.7	142.3	95	2 633.2	2 580.5	52.7	98
	----- 1977--	2 077.6	1 765.2	184.5	127.9	91	1 828.6	1 765.2	63.4	97
2992	Lubricating oils and greases ----- 1987--	3 765.6	3 388.3	172.4	204.8	95	3 622.2	3 388.3	233.8	94
	----- 1982--	2 875.3	2 574.9	156.6	143.8	94	5 609.7	2 574.9	3 034.8	95
	----- 1977--	1 644.7	1 425.5	88.1	131.1	94	3 232.8	1 425.5	1 807.3	94
2999	Petroleum and coal products, n.e.c. ----- 1987--	713.1	612.1	28.8	72.2	95	647.9	612.1	35.8	94

**Table 6a-1. Product and Product Classes—Quantity and Value of Shipments by All Producers: 1987 and 1982**

[Includes quantity and value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of a company to another establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987				1982			
		Number of companies with shipments of \$100,000 or more	Receipts <sup>2</sup> (quantity)	Product shipments <sup>1</sup>		Number of companies with shipments of \$100,000 or more	Receipts <sup>2</sup> (quantity)	Product shipments	
				Quantity <sup>3</sup>	Value (million dollars)			Quantity <sup>3</sup>	Value (million dollars)
<b>2911- --</b>	<b>PETROLEUM REFINING</b>								
	<b>Total -----</b>	<b>(NA)</b>	<b>(X)</b>	<b>(X)</b>	<b>114 307.2</b>	<b>(NA)</b>	<b>(X)</b>	<b>(X)</b>	<b>185 978.1</b>
29111 --	Gasoline, including finished base stocks and blending agents <sup>4</sup> -----	(NA)	(X)	(X)	58 669.3	(NA)	(X)	(X)	95 114.7
29111 11	Aviation gasoline, except jet fuel ----- mil bbl	17	(S)	15.1	457.5	24	(S)	(S)	(S)
29111 31	Motor gasoline ----- do	74	(S)	2 521.1	57 911.4	104	(S)	2 284.8	90 211.9
29111 00	Gasoline, including finished base stocks and blending agents, n.s.k. -----	(NA)	(X)	(X)	300.3	(NA)	(X)	(X)	45.3
29112 --	Jet fuel -----	(NA)	(X)	(X)	10 435.0	(NA)	(X)	(X)	14 862.4
29112 11	Naphtha type ----- mil bbl	41	(S)	77.2	1 651.5	54	(S)	75.7	2 997.4
29112 13	Kerosene type ----- do	52	(S)	406.6	8 767.2	55	(S)	306.4	11 814.2
29112 00	Jet fuel, n.s.k. -----	(NA)	(X)	(X)	16.3	(NA)	(X)	(X)	50.8
29113 --	Kerosene: -----								
29113 00	Kerosene, except jet fuel ----- mil bbl	37	(S)	25.9	592.9	48	(S)	47.0	1 886.6
29114 --	Light fuel oils -----	(NA)	(X)	(X)	21 586.5	(NA)	(X)	(X)	37 302.6
29114 12	Distillate fuel oil, including grades No. 1, 2, light diesel-type, light gas-enrichment oils, etc. ----- mil bbl	96	(S)	1 010.1	21 057.5	125	(S)	980.0	36 177.4
29114 14	No. 4 type fuel oil ----- do	21	(S)	24.3	474.5	33	(S)	28.3	963.5
29114 00	Light fuel oils, n.s.k. -----	(NA)	(X)	(X)	54.6	(NA)	(X)	(X)	161.7
29115 --	Heavy fuel oils: -----								
29115 00	Heavy fuel oils, including grades No. 5, 6, heavy diesel-type, heavy gas-enrichment oils, etc. ----- mil bbl	78	(S)	350.1	5 465.3	120	(S)	445.6	11 390.6
29117 --	Lubricating oils and greases, made in a refinery (see table 6a-2) -----	(NA)	(X)	(X)	1 457.7	(NA)	(X)	(X)	2 891.4
29117 21	Lubricating and similar oils, including hydraulic fluids, quenching and cutting oils, transformer oils, and liquid rust preventives ----- mil bbl	18	(S)	(S)	1 427.6	32	(S)	37.3	2 748.9
29117 31	Lubricating greases <sup>5</sup> ----- do	4	(S)	(S)	30.2	17	(S)	1.2	142.5
29117 00	Lubricating oils and greases, made in refineries, n.s.k. -----	(NA)	(X)	(X)	30.2	(NA)	(X)	(X)	-
29118 --	Unfinished oils and lubricating oil base stock -----	(NA)	(X)	(X)	4 177.1	(NA)	(X)	(X)	8 065.9
29118 13	Unfinished oils, naphthenic and paraffinic <sup>6</sup> ----- mil bbl	30	(S)	76.4	1 462.5	45	(S)	123.3	4 379.6
29118 16	Naphtha and other oils for use as petrochemical feedstocks, excluding carbon black ----- do	25	(S)	85.0	1 423.2	19	(S)	53.9	1 710.0
29118 17	Carbon black feedstock ----- do	17	(S)	11.9	174.6	15	(S)	15.1	394.8
29118 51	Lubricating oil petroleum-base stocks (for blending, compounding, and grease manufacture): <sup>7</sup> -----								
29118 52	Bright stock ----- mil bbl	10	(S)	3.9	120.1	14	(S)	3.1	200.1
29118 56	Neutral stock ----- do	17	(S)	21.3	782.0	24	(S)	16.3	1 013.5
29118 59	Red and pale oils ----- do	5	(S)	2.0	88.4	10	(S)	3.0	56.4
29118 00	Other oils ----- do	6	(S)	3.1	104.0	12	(S)	*9.5	261.5
29119 --	Asphalt <sup>8</sup> -----	(NA)	(X)	(X)	22.4	(NA)	(X)	(X)	50.0
29119 21	Paving grade asphalts ----- mil bbl	47	(S)	129.7	2 099.5	62	(S)	95.2	2 187.5
29119 31	Roofing grade asphalts ----- do	19	(S)	12.0	205.0	26	(S)	17.7	452.3
29119 41	Miscellaneous asphalts, n.e.c. ----- do	16	(S)	10.6	166.7	24	(S)	*10.4	285.6
29119 00	Asphalt, n.s.k. -----	(NA)	(X)	(X)	50.0	(NA)	(X)	(X)	54.8
2911A --	Liquefied refinery gases, including other aliphatics (feed stock and other uses), made in a refinery (see table 6a-2) -----	(NA)	(X)	(X)	3 649.4	(NA)	(X)	(X)	4 454.7
2911A 21	Chemical raw material, including synthetic rubber components (for detailed statistics, see U.S. International Trade Commission publication, Synthetic Organic Chemicals, 1987 and 1982) ----- mil bbl	40	(S)	178.5	2 213.5	53	(S)	156.7	3 536.2
2911A 22	Other uses ----- do	31	(S)	87.7	1 185.8	35	(S)	40.3	918.5
2911A 00	Liquefied refinery gases, including other aliphatics (feed stock and other uses), made in a refinery, n.s.k. -----	(NA)	(X)	(X)	250.0	(NA)	(X)	(X)	-
2911D --	Other finished petroleum products, including waxes -----	(NA)	(X)	(X)	4 045.6	(NA)	(X)	(X)	5 507.8
2911D 11	Petrolatum ----- mil bbl	10	(S)	4.6	168.2	11	(S)	**3.2	122.3
2911D 23	Petroleum coke ----- 1,000 s tons	27	(S)	(S)	488.6	35	(S)	20 105.5	802.5
2911D 25	Calcined petroleum coke, made in a refinery ----- do	5	(S)	(S)	151.8				
2911D 31	Road oil <sup>9</sup> ----- mil bbl	6	(S)	.5	8.4	6	(S)	.8	21.5
2911D 41	Still gas ----- bil cu ft	8	(S)	30.6	54.6	10	(S)	53.5	218.8
2911D 51	Special naphthas <sup>10</sup> ----- mil bbl	11	(S)	10.6	275.0	24	(S)	16.6	629.4
2911D 55	Aromatics, made in a refinery (see table 6a-2): -----								
2911D 57	Chemical raw material (for detailed statistics, see U.S. International Trade Commission publication, Synthetic Organic Chemicals, 1987 and 1982) ----- mil bbl	19	(S)	60.0	2 134.6	23	(S)	45.8	2 402.7
2911D 62	Other uses ----- do	4	(S)			9	(S)	11.8	467.7
2911D 72	Waxes, made in a refinery (see table 6a-2): -----								
2911D 82	Microcrystalline <sup>11</sup> ----- mil bbl	8	(S)	(S)	47.2	8	(S)	(S)	41.0
2911D 99	Crystalline: -----								
2911D 00	Fully refined ----- mil bbl	13	(S)	3.6	177.7	11	(S)	2.7	197.4
2911D 01	Other ----- do	4	(S)	.7	34.2	12	(S)	**2.1	100.3
2911D 02	Other finished petroleum products ----- do	23	(X)	(S)	415.5	37	(S)	(S)	504.3
2911D 03	Other finished petroleum products, including waxes, n.s.k. -----	(NA)	(X)	(X)	89.8	(NA)	(X)	(X)	( <sup>12</sup> )
29110 --	Petroleum products, n.s.k. -----	(NA)	(X)	(X)	1 707.2	(NA)	(X)	(X)	1 521.2
29110 00	Petroleum products, n.s.k., typically for establishments with 10 employees or more (see note) -----	(NA)	(X)	(X)	1 707.2	(NA)	(X)	(X)	121 521.2
29110 02	Petroleum products, n.s.k., typically for establishment with less than 10 employees (see note) -----	(NA)	(X)	(X)	-	-	(X)	(X)	-

See footnotes at end of table.



**Table 6a-1. Product and Product Classes—Quantity and Value of Shipments by All Producers: 1987 and 1982—Con.**

[Includes quantity and value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of a company to another establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987			1982		
		Number of companies with shipments of \$100,000 or more	Product shipment <sup>1</sup>		Number of companies with shipments of \$100,000 or more	Product shipment <sup>1</sup>	
			Quantity <sup>3</sup>	Value (million dollars)		Quantity <sup>3</sup>	Value (million dollars)
<b>2951- --</b>	<b>ASPHALT PAVING MIXTURES AND BLOCKS</b>						
	<b>Total -----</b>	<b>(NA)</b>	<b>(X)</b>	<b>4 087.0</b>	<b>(NA)</b>	<b>(X)</b>	<b>2 881.0</b>
29510 --	Paving mixtures and blocks:						
	Liquid asphalt and tar paving materials:						
29510 11	Emulsified asphalt, including liquid additives ----- 1,000 bbl..	62	(S)	476.4	81	**13 161.0	376.7
29510 15	Other liquid asphalt and tar paving materials, including cut-backs ----- do..	44	(S)	260.5	35	**3 595.7	109.8
29510 51	Asphalt and tar paving mixtures (including bituminous or asphaltic concrete) and asphaltic paving cements -----	324	(X)	2 368.0	362	(X)	1 879.9
29510 98	Other paving mixtures, except brick, concrete, granite, or stone -----	18	(X)	53.4	22	(X)	48.6
29510 00	Paving mixtures and blocks, n.s.k., typically for establishments with 5 employees or more (see note) -----	(NA)	(X)	809.2	(NA)	(X)	447.7
29510 02	Paving mixtures and blocks, n.s.k., typically for establishments with less than 5 employees (see note) -----	(NA)	(X)	119.4	(NA)	(X)	18.3
<b>2952- --</b>	<b>ASPHALT FELTS AND COATINGS</b>						
	<b>Total -----</b>	<b>(NA)</b>	<b>(X)</b>	<b>3 174.1</b>	<b>(NA)</b>	<b>(X)</b>	<b>2 633.2</b>
29521 --	Asphalt and tar saturated felts and boards for nonbuilding use -----	(NA)	(X)	38.4	(NA)	(X)	64.4
	Felts for nonbuilding uses (automotive, etc.):						
29521 13	Organic -----	2	}	(13)	4	(X)	31.3
29521 15	Inorganic -----	1					
29521 31	Asphalt and tar products (except felts, coatings, cement) for nonbuilding use (i.e., automotive, etc.) ----- 1,000 s tons..	9	(S)	138.4	15	(S)	31.5
29521 00	Asphalt and tar saturated felts and boards for nonbuilding use, n.s.k. -----	(NA)	(X)	-	(NA)	(X)	1.6
29522 --	Roofing asphalts and pitches, coatings, and cements -----	(NA)	(X)	451.0	(NA)	(X)	466.8
29522 12	Roofing asphalt ----- 1,000 s tons..	13	*915.1	126.4	18	932.3	173.7
	Asphaltic roofing coatings and cements:						
29522 51	Fibred asphaltic coatings ----- mil gal..	21	**43.9	99.6	34	45.3	106.9
29522 55	Nonfibred asphaltic coatings ----- do..	14	(S)	76.8	26	**7.6	18.3
29522 61	Asphaltic roofing cements ----- do..	22	(S)	52.9	30	(S)	76.3
29522 98	Other roofing asphalts and pitches, coatings, and cements, including coal-tar base coatings, cements, and roofing pitches -----	19	(X)	78.5	36	(X)	76.5
29522 00	Roofing asphalts and pitches, coatings, and cements, n.s.k. -----	(NA)	(X)	16.8	(NA)	(X)	15.1
29523 --	Prepared asphalt and tar roofing and siding products -----	(NA)	(X)	2 375.1	(NA)	(X)	2 030.8
	Smooth-surfaced roll roofing and cap sheets (including sanded, talc, mica, and other fine material surfacing):						
29523 21	Organic base ----- mil sales sq..	12	(S)	51.5	15	7.9	47.4
29523 22	Fiberglass base ----- do..	13	(S)	238.2	13	16.1	93.7
	Mineral-surfaced roll roofing and cap sheets (including 17- inch and 19-inch selvage edged):						
29523 23	Organic base ----- mil sales sq..	11	9.4	74.6	18	11.9	129.9
29523 24	Fiberglass base ----- do..	12	(S)	135.4	10	2.3	29.5
	Shingles:						
29523 25	Organic base:						
	235 to 240 lb/sq. ----- mil sales sq..	6	3.6	67.6	15	16.6	306.6
29523 26	All other weights (excluding laminated) ----- do..	5	9.2	162.6	8	6.3	117.7
	Inorganic base:						
29523 27	215 to 235 lb/sq. ----- mil sales sq..	10	*21.6	347.2	12	30.5	577.5
29523 28	All other weights (excluding laminated) ----- do..	11	47.2	743.4	8	6.0	127.7
29523 29	Organic and/or inorganic base laminated or multilayered shingles ----- do..	11	*9.2	282.9	6	1.5	55.5
29523 31	Individual shingles, organic or inorganic base, all styles ----- do..	5	.6	15.4	13	1.4	34.2
29523 33	Mineral-surfaced insulating board base siding (all types and finishes), organic or inorganic base ----- do..	2	(D)	(D)	1	(D)	(14)
29523 60	Saturated asphalt and tar felts:						
	Ply felts, organic base ----- 1,000 s tons..	14	(S)	57.3	}	(NA)	212.6
29523 62	Ply felts, fiberglass base ----- do..	8	(S)	46.3			
29523 64	Other felts, organic base ----- do..	10	(S)	79.4			
29523 66	Other felts, fiberglass base ----- do..	3	(D)	(D)			
29523 99	Other prepared asphalt and tar products for roofing and siding, including board products and sheathing and felt base roll form and shingle form -----	13	(X)	41.3	16	(X)	14278.0
29523 00	Prepared asphalt and tar roofing and siding products, n.s.k. -----	(NA)	(X)	27.0	(NA)	(X)	20.6
29520 --	Asphalt felts and coatings, n.s.k. -----	(NA)	(X)	309.6	(NA)	(X)	71.2
29520 00	Asphalt felts and coatings, n.s.k., typically for establishments with 10 employees or more (see note) -----	(NA)	(X)	215.9	(NA)	(X)	62.5
29520 02	Asphalt felts and coatings, n.s.k., typically for establishments with less than 10 employees (see note) -----	(NA)	(X)	93.7	(NA)	(X)	8.7

See footnotes at end of table.

**Table 6a-1. Product and Product Classes—Quantity and Value of Shipments by All Producers: 1987 and 1982—Con.**

[Includes quantity and value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of a company to another establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987				1982			
		Number of companies with shipments of \$100,000 or more	Receipts <sup>2</sup> (quantity)	Product shipments <sup>1</sup>		Number of companies with shipments of \$100,000 or more	Receipts <sup>2</sup> (quantity)	Product shipments	
				Quantity <sup>3</sup>	Value (million dollars)			Quantity <sup>3</sup>	Value (million dollars)
<b>2992- --</b>	<b>LUBRICATING OILS AND GREASES</b>								
	<b>Total .....</b>	<b>(NA)</b>	<b>(X)</b>	<b>(X)</b>	<b>3 622.2</b>	<b>(NA)</b>	<b>(X)</b>	<b>(X)</b>	<b>2 718.3</b>
29920 --	Lubricating oils and greases, not made in a refinery (see table 6a-2):								
29920 21	Lubricating and similar oils, including hydraulic fluids, quenching and cutting oils, transformer oils, and liquid rust preventives.....mil bbl..	169	(S)	(S)	2 574.4	201	(S)	*23.6	2 065.0
29920 31	Lubricating greases <sup>5</sup> .....do..	51	(S)	(S)	335.7	66	(S)	**2.6	323.7
29920 00	Lubricating oils and greases not made in a refinery, n.s.k., typically for establishments with 5 employees or more (see note).....	(NA)	(X)	(X)	648.6	(NA)	(X)	(X)	309.7
29920 02	Lubricating oils and greases not made in a refinery, n.s.k., typically for establishments with less than 5 employees (see note).....	(NA)	(X)	(X)	63.5	(NA)	(X)	(X)	19.9
1987 product code	Product	1987				1982			
		Number of companies with shipments of \$100,000 or more	Product shipment <sup>1</sup>	Quantity <sup>3</sup>	Value (million dollars)	Number of companies with shipments of \$100,000 or more	Product shipment <sup>1</sup>	Quantity <sup>3</sup>	Value (million dollars)
<b>2999- --</b>	<b>PETROLEUM AND COAL PRODUCTS, N.E.C.</b>								
	<b>Total .....</b>	<b>(NA)</b>	<b>(X)</b>	<b>(X)</b>	<b>647.9</b>	<b>(NA)</b>	<b>(X)</b>	<b>(X)</b>	<b>801.8</b>
29990 --	Petroleum and coal products, n.e.c.:								
29990 15	Packaged fuel and fuel briquettes, except wood charcoal briquettes.....1,000 s tons..	1	(D)	(D)		2	(D)	(D)	
29990 20	Waxes, not made in a refinery (see table 6a-2):								
29990 30	Microcrystalline <sup>11</sup> .....mil bbl..	10	}	(S)	91.3	12		117.8	101.5
29990 91	Crystalline.....do..	4							
29990 91	Calcined petroleum coke, not made in a refinery.....1,000 s tons..	12	(S)	(S)	362.3	17		4 193.7	568.0
29990 93	Petroleum pitch.....do..	3	(D)	(D)					
29990 99	Other petroleum and coal products, n.e.c. ....do..	18	(S)	(S)	63.9	27	(X)		67.4
29990 00	Petroleum and coal products, n.e.c., n.s.k., typically for establishments with 5 employees or more (see note).....	(NA)	(X)	(X)	56.4	(NA)	(X)	(X)	(D)
29990 02	Petroleum and coal products, n.e.c., n.s.k., typically for establishments with less than 5 employees (see note).....	(NA)	(X)	(X)	63.4	(NA)	(X)	(X)	7.1

Note: In 1987 Census of Manufactures, data for establishments of small single unit companies with up to 20 employees were estimated from administrative-record data rather than data actually collected from respondents. Employment cutoffs used for administrative records for each industry and shipments figures are included in code ending with "002". In both 1987 and 1982 Censuses of Manufactures, products not completely identified on standard forms were coded in appropriate product class (five-digit) followed by "00" or to appropriate product group code (four-digit) followed by "000".

<sup>1</sup>Data reported by all producers, not just those with shipments of \$100,000 or more.

<sup>2</sup>Reporting companies were requested to report quantities of refined petroleum received in refineries for further processing and to classify items in the same manner as they were billed by shipper, regardless of how refinery (or blending and compounding establishment) would otherwise classify item.

<sup>3</sup>For some establishments, data have been estimated from central unit values which are based on quantity-value relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: \* 10 to 19 percent estimated; \*\* 20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by (S).

<sup>4</sup>Includes all finished gasolines, finished base stocks and blending agents, such as alkylate, polymers (dimer, codimer, etc.), hydropolymers (hydrodimer, hydrocodimer, etc.), cumene, isopentane, isohexane, neohexane, iso-octane, motor benzol (benzene), and other blending agents derived from petroleum. Excludes natural gasoline derived from natural gas.

<sup>5</sup>Includes greases for aviation, automotive, industrial, and railroad uses; launching grease, cutting, drawing, and grinding compounds; and paste. Also includes paste rust-preventative compounds and thread compounds.

<sup>6</sup>Includes such products as cracking stock, unfinished gasoline requiring further distillation, naphtha stocks, slops, wax distillate, and other unfinished petroleum oils. Excludes lubricating oil base stocks, natural gasoline, and cycle condensates.

<sup>7</sup>Includes light, medium, heavy natural, and residual stocks.

<sup>8</sup>Includes asphalt and fluxes for paving, roofing, waterproofing, briquetting, mastic pipe coating, and molding composition; cutback asphalt, emulsified asphalt, and fluxes produced in petroleum refineries; and other asphaltic products, except road oil and fuel for heating purposes.

<sup>9</sup>Represents residual asphaltic oil used for surface treatment of roads and highways.

<sup>10</sup>Includes petroleum ether, rubber solvent, mineral spirits (petroleum spirits), varnish makers' and painters' naphtha, high-solvency naphtha, benzol diluent, lacquer diluent, cleaners' naphtha, Stoddard solvent, extraction solvents, and other petroleum distillates shipped as solvents.

<sup>11</sup>Represents amorphous paraffin of melting point not less than 145°F.

<sup>12</sup>For 1982, product code 2911D 00 was included with product code 29110 00.

<sup>13</sup>For 1987, product codes 29521 13 and 29521 15 are included with product class 29521 31 to avoid disclosing data for individual companies.

<sup>14</sup>For 1982, product code 29523 33 was included with product code 29523 99 to avoid disclosing data for individual companies.



Table 6a-2. Selected Products Primary to More Than One Industry—Quantity and Value of Shipments by Industry: 1987 and 1982

[Includes quantity and value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of a company to another establishment of the same company (interplant transfers) also are included. For further explanation, see Value Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987			1982		
		Number of companies with shipments of \$100,000 or more	Product shipments <sup>1</sup>		Number of companies with shipments of \$100,000 or more	Product shipments <sup>1</sup>	
			Quantity <sup>2</sup>	Value (million dollars)		Quantity <sup>2</sup>	Value (million dollars)
29117	Lubricating oils and greases .....	(NA)	(X)	5 079.9	(NA)	(X)	5 609.7
29920	Made in petroleum refineries .....	(NA)	(X)	1 457.7	(NA)	(X)	2 891.4
	Not made in petroleum refineries .....	(NA)	(X)	3 622.2	(NA)	(X)	2 718.3
29117 21	Lubricating and similar oils .....	(NA)	(D)	(D)	(NA)	60.9	4 813.8
29920 21	Made in petroleum refineries .....	18	(D)	(D)	32	37.3	2 748.9
	Not made in petroleum refineries .....	169	(S)	2 574.4	201	23.6	2 065.0
	Lubricating greases .....	(NA)	(D)	(D)	(NA)	3.8	466.3
29117 31	Made in petroleum refineries .....	4	(D)	(D)	17	1.2	142.5
29920 31	Not made in petroleum refineries .....	51	(S)	335.7	66	2.6	323.7
	Lubricating oils and greases, n.s.k. ....	(NA)	(X)	742.3	(NA)	(X)	329.6
29117 00	Made in petroleum refineries .....	(NA)	(X)	30.2	(NA)	(X)	-
29920 00	Not made in petroleum refineries, typically for establishments with 5 employees or more .....	(NA)	(X)	648.6	(NA)	(X)	309.7
29920 02	Not made in petroleum refineries, typically for establishments with less than 5 employees .....	(NA)	(X)	63.5	(NA)	(X)	19.9
2911A	Liquefied refinery gases, including other aliphatics .....	(NA)	(X)	8 574.8	(NA)	(X)	8 396.1
28691	Made in petroleum refineries .....	(NA)	(X)	3 649.4	(NA)	(X)	4 454.7
	Not made in petroleum refineries .....	(NA)	(X)	4 925.4	(NA)	(X)	3 941.4
	Chemical raw material, including synthetic rubber components .....	(NA)	345.4	6 853.4	(NA)	312.0	7 179.8
2911A 21	Made in petroleum refineries .....	40	178.5	2 213.5	53	156.7	3 536.2
28691 32	Not made in petroleum refineries .....	22	166.9	4 639.9	29	155.3	3 643.6
	Other uses .....	(NA)	97.7	1 456.5	(NA)	(S)	1 216.2
2911A 22	Made in petroleum refineries .....	31	87.7	1 185.8	35	40.3	918.5
28691 33	Not made in petroleum refineries .....	7	10.0	270.7	8	(S)	297.7
	Liquefied refinery gases, n.s.k. ....	(NA)	(X)	264.8	(NA)	(X)	-
2911A 00	Made in petroleum refineries .....	(NA)	(X)	250.0	(NA)	(X)	-
28691 00	Not made in petroleum refineries .....	(NA)	(X)	14.8	(NA)	(X)	-
2911D (pt)	Aromatics .....	(NA)	(X)	3 258.6	(NA)	(X)	4 224.1
28656	Made in petroleum refineries .....	(NA)	(X)	2 134.6	(NA)	(X)	2 870.4
	Not made in petroleum refineries .....	(NA)	(X)	1 124.0	(NA)	(X)	1 353.7
	Chemical raw material .....	(NA)	83.0	2 936.5	(NA)	(D)	(D)
2911D 55	Made in petroleum refineries .....	19	(D)	(D)	23	45.8	2 402.7
28656 58	Not made in petroleum refineries .....	14	(D)	(D)	13	(D)	(D)
	Other uses .....	(NA)	10.0	318.7	(NA)	(D)	(D)
2911D 57	Made in petroleum refineries .....	4	(D)	(D)	9	11.8	467.7
28656 59	Not made in petroleum refineries .....	3	(D)	(D)	2	(D)	(D)
28656 00	Aromatics, n.s.k., not made in petroleum refineries .....	(NA)	(X)	3.4	(NA)	(X)	-
2911D 62	Waxes .....	(NA)	(X)	350.4	(NA)	(X)	440.2
29990 20	Made in petroleum refineries .....	(NA)	(X)	259.1	(NA)	(X)	338.7
	Not made in petroleum refineries .....	(NA)	(X)	91.3	(NA)	(X)	101.5
	Microcrystalline .....	(NA)	(D)	(D)	(NA)	(NA)	(NA)
	Made in petroleum refineries .....	8	(S)	47.2	8	(S)	41.0
	Not made in petroleum refineries .....	10	(D)	(D)	312	3117.8	3101.5
	Crystalline .....	(NA)	(D)	(D)	(NA)	(NA)	(NA)
2911D 72	Made in petroleum refineries .....	(NA)	4.3	211.9	(NA)	4.8	297.7
2911D 82	Fully refined .....	13	3.6	177.7	11	2.7	197.4
29990 30	Other .....	4	.7	34.2	12	**2.1	100.3
	Not made in petroleum refineries .....	4	(D)	(D)	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )

<sup>1</sup>Data reported by all producers, not just those with shipments of \$100,000 or more.  
<sup>2</sup>For some establishments, data have been estimated from central unit values which are based on quantity-value relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: \* 10 to 19 percent estimated; \*\* 20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by (S).  
<sup>3</sup>For 1982, product codes 29990 20 and 29990 30 were combined to avoid disclosing data for individual companies.

Table 6b. Product Classes—Value of Shipments by All Producers for Specified States: 1987 and 1982

[Million dollars. Product classes covered are those that are economically significant and whose production is geographically dispersed, provided dispersion is not approximated by data in table 2. Also, product classes are not shown if they are miscellaneous or "not specified by type" classes. Statistics for some States are withheld because they are either less than \$2 million in product class shipments or they disclose data for individual companies in 1987. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

Product class and geographic area	1987 value of product shipments	1982 value of product shipments	Product class and geographic area	1987 value of product shipments	1982 value of product shipments
<b>29111, GASOLINE</b>			<b>29111, GASOLINE—Con.</b>		
<b>United States</b> .....	58 669.3	95 114.7	Pennsylvania .....	2 975.6	4 919.3
California .....	7 959.4	10 872.0	Texas .....	16 834.9	25 658.4
Colorado .....	286.3	526.3	Utah .....	575.4	848.1
Illinois .....	3 958.1	7 101.4	Washington .....	1 656.7	2 255.0
Kansas .....	1 531.4	3 232.1	Wyoming .....	539.8	955.8
Louisiana .....	8 561.9	13 986.9			
Montana .....	537.2	904.1	<b>29112, JET FUEL</b>		
New Jersey .....	1 615.3	2 810.4	<b>United States</b> .....	10 435.0	14 862.4
New Mexico .....	329.5	636.0	California .....	1 809.8	2 769.0
Ohio .....	2 276.1	4 438.9	Louisiana .....	1 881.4	2 630.3
Oklahoma .....	1 582.5	3 436.7			

Table 6b. **Product Classes—Value of Shipments by All Producers for Specified States: 1987 and 1982—Con.**

[Million dollars. Product classes covered are those that are economically significant and whose production is geographically dispersed, provided dispersion is not approximated by data in table 2. Also, product classes are not shown if they are miscellaneous or "not specified by type" classes. Statistics for some States are withheld because they are either less than \$2 million in product class shipments or they disclose data for individual companies in 1987. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

Product class and geographic area	1987 value of product shipments	1982 value of product shipments	Product class and geographic area	1987 value of product shipments	1982 value of product shipments
<b>29112, JET FUEL—Con.</b>			<b>29119, ASPHALT</b>		
Montana .....	70.1	126.8	United States .....	2 521.2	2 980.3
New Jersey .....	104.0	(NA)	Arkansas .....	70.1	88.5
Oklahoma .....	290.6	445.4	California .....	313.4	346.4
Pennsylvania .....	459.3	474.8	Illinois .....	203.7	(NA)
Texas .....	2 646.4	3 639.1	Kansas .....	43.8	107.7
Utah .....	121.4	142.5	Minnesota .....	139.1	(NA)
Washington .....	534.1	579.9	Mississippi .....	100.9	(NA)
Wyoming .....	50.2	53.2	Montana .....	47.1	72.7
<b>29113, KEROSENE</b>			New Jersey .....	268.2	(NA)
United States .....	592.9	1 886.6	Oklahoma .....	83.9	83.7
Louisiana .....	131.2	494.3	Texas .....	181.1	268.0
Pennsylvania .....	80.0	49.4	<b>2911A, LIQUEFIED REFINERY GASES MADE IN A REFINERY (SEE ALSO CODE 28691)</b>		
<b>29114, LIGHT FUEL OILS</b>			United States .....	3 649.4	4 454.7
United States .....	21 586.5	37 302.6	California .....	155.5	193.8
Alabama .....	231.0	289.4	Illinois .....	108.8	178.7
Alaska .....	148.8	189.6	Kansas .....	24.7	44.1
California .....	2 233.5	3 487.0	Louisiana .....	741.0	842.7
Colorado .....	85.8	241.0	Oklahoma .....	12.5	141.8
Illinois .....	1 156.6	2 161.1	Pennsylvania .....	104.0	87.8
Kansas .....	741.9	1 497.5	Texas .....	1 992.9	2 353.3
Louisiana .....	3 233.0	5 133.0	Utah .....	10.6	11.8
Montana .....	221.4	397.3	Washington .....	28.4	22.3
New Jersey .....	681.1	1 601.4	<b>2911D, OTHER FINISHED PETROLEUM PRODUCTS, INCLUDING WAXES</b>		
New Mexico .....	121.1	388.2	United States .....	4 045.6	5 507.8
Oklahoma .....	549.5	1 494.4	California .....	264.4	(NA)
Pennsylvania .....	982.0	1 718.9	Illinois .....	191.4	(NA)
Texas .....	6 210.6	11 141.7	Kansas .....	20.8	(NA)
Utah .....	243.4	446.3	Louisiana .....	476.4	(NA)
Washington .....	688.0	921.9	Pennsylvania .....	266.5	(NA)
Wyoming .....	270.0	470.1	Texas .....	1 933.1	(NA)
<b>29115, HEAVY FUEL OILS</b>			<b>29521, ASPHALT AND TAR SATURATED FELTS AND BOARDS FOR NONBUILDING USE</b>		
United States .....	5 465.3	11 390.6	United States .....	38.4	64.4
California .....	1 638.2	2 778.4	<b>29522, ROOFING ASPHALTS AND PITCHES, COATINGS, AND CEMENTS</b>		
Colorado .....	8.4	(NA)	United States .....	451.0	466.8
Illinois .....	124.0	178.8	California .....	56.1	45.7
Indiana .....	35.0	236.9	Florida .....	38.0	28.6
Louisiana .....	711.1	2 117.9	Illinois .....	19.6	34.8
Montana .....	3.7	31.5	Indiana .....	11.8	(NA)
New Jersey .....	249.2	560.8	Michigan .....	11.5	(NA)
Ohio .....	43.5	68.6	New Jersey .....	45.5	45.5
Oklahoma .....	26.6	109.6	Ohio .....	79.3	68.4
Pennsylvania .....	524.2	682.2	Pennsylvania .....	37.3	30.7
Texas .....	1 119.0	2 707.2	Texas .....	47.5	62.7
Utah .....	7.7	12.5	<b>29523, PREPARED ASPHALT AND TAR ROOFING AND SIDING PRODUCTS</b>		
Washington .....	311.0	473.0	United States .....	2 375.1	2 030.8
Wyoming .....	37.3	(NA)	Alabama .....	171.5	103.9
<b>29117, LUBRICATING OILS AND GREASES, MADE IN A REFINERY (SEE ALSO CODE 29920)</b>			Arkansas .....	29.2	67.0
United States .....	1 457.7	2 891.4	California .....	234.6	229.3
California .....	96.9	245.7	Georgia .....	172.4	122.1
Pennsylvania .....	202.2	531.2	Illinois .....	138.7	153.8
Texas .....	534.6	868.3	Indiana .....	142.5	69.8
<b>29118, UNFINISHED OILS AND LUBRICATING OIL BASE STOCK</b>			Maryland .....	140.0	41.1
United States .....	4 177.1	8 065.9	Minnesota .....	111.7	78.6
Arkansas .....	30.0	23.8	North Carolina .....	119.8	67.1
California .....	768.6	1 821.2	Ohio .....	186.2	137.3
Illinois .....	62.8	112.4	Oregon .....	46.2	42.5
Louisiana .....	954.1	1 786.7	Texas .....	214.7	225.5
New Jersey .....	102.8	102.6			
Pennsylvania .....	252.0	305.8			
Texas .....	1 282.7	2 972.9			



**Table 6c. Historical Statistics for Product Classes—Value Shipped by All Producers: 1987 and Earlier Years**

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

1987 product code	Product class	1987	1986 <sup>1</sup>	1985 <sup>1</sup>	1984 <sup>1</sup>	1983 <sup>1</sup>	1982	1977	1972
2911-	<b>Petroleum refining</b> .....	<b>114 307.2</b>	<b>102 949.0</b>	<b>157 946.2</b>	<b>166 246.6</b>	<b>169 967.0</b>	<b>185 978.1</b>	<b>(NA)</b>	<b>(NA)</b>
29111	Gasoline .....	58 669.3	51 538.8	79 130.5	80 810.0	86 425.6	95 114.7	41 840.4	13 029.6
29112	Jet fuel .....	10 435.0	9 670.5	14 132.3	14 270.1	13 755.2	14 862.4	5 358.9	1 371.6
29113	Kerosene .....	592.9	857.4	1 054.3	1 311.0	1 216.4	1 886.6	892.9	372.4
29114	Light fuel oils .....	21 586.5	19 433.2	30 831.7	33 431.1	32 355.4	37 302.6	17 509.4	4 407.7
29115	Heavy fuel oils .....	5 465.3	4 821.7	9 088.7	10 143.7	10 178.9	11 390.6	6 793.9	1 107.2
29117	Lubricating oils and greases, made in a refinery (see also code 29920) .....	1 457.7	1 974.3	2 762.5	3 245.6	3 115.3	2 891.4	1 718.9	894.8
29118	Unfinished oils and lubricating oil base stock .....	4 177.1	4 229.7	6 254.9	7 893.6	8 241.5	8 065.9	2 887.8	733.7
29119	Asphalt .....	2 521.2	2 264.8	3 543.0	3 699.5	3 266.2	2 980.3	2 216.7	671.5
2911A	Liquefied refinery gases made in a refinery (see also code 28691) ..	3 649.4	3 255.5	4 716.8	4 589.6	4 051.9	4 454.7	(NA)	(NA)
2911D	Other finished petroleum products, including waxes .....	4 045.6	4 308.7	5 276.8	5 213.2	5 800.6	5 507.8	(NA)	(NA)
29110	Petroleum products, n.s.k. ....	1 707.2	594.4	1 154.7	1 639.2	1 560.0	1 521.2	(NA)	(NA)
2951-	<b>Asphalt paving mixtures and blocks</b> .....	<b>4 087.0</b>	<b>3 778.0</b>	<b>3 809.2</b>	<b>3 344.2</b>	<b>3 014.6</b>	<b>2 881.0</b>	<b>1 518.6</b>	<b>893.4</b>
29510	Paving mixtures and blocks .....	4 087.0	3 778.0	3 809.2	3 344.2	3 014.6	2 881.0	1 518.6	893.4
2952-	<b>Asphalt felts and coatings</b> .....	<b>3 174.1</b>	<b>3 260.7</b>	<b>3 288.8</b>	<b>3 087.6</b>	<b>3 028.1</b>	<b>2 633.2</b>	<b>1 828.6</b>	<b>902.2</b>
29521	Asphalt and tar saturated felts and boards for nonbuilding use .....	38.4	47.6	35.5	39.5	75.2	64.4	99.5	34.2
29522	Roofing asphalts and pitches, coatings, and cements .....	451.0	646.9	714.4	529.0	437.1	466.8	263.4	155.3
29523	Prepared asphalt and tar roofing and siding products .....	2 375.1	2 404.6	2 356.2	2 358.6	2 402.2	2 030.8	1 405.3	690.6
29520	Asphalt felts and coatings, n.s.k. ....	309.6	161.7	182.7	160.5	113.7	71.2	60.5	22.1
2992-	<b>Lubricating oils and greases</b> .....	<b>3 622.2</b>	<b>3 184.7</b>	<b>3 196.7</b>	<b>3 157.8</b>	<b>2 668.1</b>	<b>2 718.3</b>	<b>1 514.0</b>	<b>642.0</b>
29920	Lubricating oils and greases, not made in a refinery (see also code 29117) .....	3 622.2	3 184.7	3 196.7	3 157.8	2 668.1	2 718.3	1 514.0	642.0
2999-	<b>Petroleum and coal products, n.e.c.</b> .....	<b>647.9</b>	<b>(NA)</b>	<b>(NA)</b>	<b>(NA)</b>	<b>(NA)</b>	<b>801.8</b>	<b>(NA)</b>	<b>(NA)</b>
29990	Petroleum and coal products, n.e.c. ....	647.9	(NA)	(NA)	(NA)	(NA)	801.8	(NA)	(NA)

<sup>1</sup>Figures are estimates derived from a representative sample of manufacturing establishments. Standard errors associated with estimates are published in annual survey of manufactures publications for this period.

**Table 7a. Materials Consumed by Kind: 1987 and 1982**

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity <sup>1</sup>	Delivered cost (million dollars)	Quantity <sup>1</sup>	Delivered cost (million dollars)
	<b>INDUSTRY 2911, PETROLEUM REFINING</b>				
	<b>Materials, containers, and supplies</b> .....	<b>(X)</b>	<b>98 513.8</b>	<b>(X)</b>	<b>(<sup>3</sup>)</b>
	Crude petroleum, including lease condensate:				
131111	Domestic .....	mil bbl.		(NA)	(NA)
131112	Foreign .....	do.		(NA)	(NA)
291181	Foreign unfinished oils (received from foreign countries for further processing) .....	do.		(NA)	(NA)
	Natural gas liquids:				
132128	Ethane (C <sub>2</sub> ), at least 80 percent purity .....	mil bbl.		(NA)	(NA)
132129	Propane (C <sub>3</sub> ), at least 80 percent purity .....	do.		(NA)	(NA)
132120	Butane (C <sub>4</sub> ), at least 80 percent purity .....	do.		(NA)	(NA)
132124	Gas mixtures (C <sub>2</sub> , C <sub>3</sub> , C <sub>4</sub> ) .....	do.		(NA)	(NA)
132125	Isopentane and natural gasoline .....	do.		(NA)	(NA)
132126	Plant condensate .....	(D)	(D)	(NA)	(NA)
132127	Other natural gas liquids .....	do.		(NA)	(NA)
291107	Benzol (benzene) (100 percent C <sub>6</sub> H <sub>6</sub> ) .....	do.		(NA)	(NA)
286519	Toluene and xylene (100 percent basis) .....	mil lb.		(NA)	(NA)
	Additives, except animal and vegetable oils:				
280011	Antioxidants, antiknock compounds, and inhibitors .....	mil lb.		(NA)	(NA)
280012	Other additives, including soaps and detergents .....	do.		(NA)	(NA)
207001	Animal and vegetable oils .....	do.		(NA)	(NA)
281980	Chemical catalytic preparations .....	(X)		(X)	(NA)
281238	Sodium hydroxide (caustic soda 100 percent NaOH) .....	1,000 s tons.		(NA)	(NA)
281931	Sulfuric acid (100 percent H <sub>2</sub> SO <sub>4</sub> ), except spent .....	do.		(NA)	(NA)
	Containers:				
340001	Metal .....	(X)		(X)	(NA)
260091	Paper and paperboard .....	(X)		(X)	(NA)
308961	Plastics .....	(X)		(X)	(NA)
265522	Fiber cans, bodies with combinations of fiber and other materials (foil, plastics, etc.) with metal ends .....	(X)		(X)	(NA)
290004	Cost of materials received from petroleum refineries and lube manufacturers .....	(X)		(X)	(NA)
970099	All other materials and components, parts, containers, and supplies .....	(X)		(X)	(NA)
971000	Materials, containers, and supplies, n.s.k. <sup>2</sup> .....	(X)		(X)	(NA)

See footnotes at end of table.

Table 7a. **Materials Consumed by Kind: 1987 and 1982—Con.**

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity <sup>1</sup>	Delivered cost (million dollars)	Quantity <sup>1</sup>	Delivered cost (million dollars)
	<b>INDUSTRY 2951, ASPHALT PAVING MIXTURES AND BLOCKS</b>				
	Materials, containers, and supplies -----	(X)	2 428.0	(X)	1 834.3
	Asphalts:				
291192	Paving grade asphalts -----mil bbl..	**51.0	903.9	**33.4	780.6
291193	Roofing grade asphalts -----do..	(S)	130.5	(S)	6.4
291194	Asphalts other than paving and roofing grade -----do..			(S)	20.7
144201	Sand and gravel -----1,000 s tons..	**70 846.0	366.2	**47 855.0	220.4
970099	All other materials and components, parts, containers, and supplies -----	(X)	317.2	(X)	342.5
971000	Materials, containers, and supplies, n.s.k. <sup>2</sup> -----	(X)	710.2	(X)	463.7
	<b>INDUSTRY 2952, ASPHALT FELTS AND COATINGS</b>				
	Materials, containers, and supplies -----	(X)	1 932.0	(X)	1 771.1
	Asphalts:				
291192	Paving grade asphalts -----mil bbl..	**3.8	71.1	**3	9.5
291193	Roofing grade asphalts -----do..	**24.1	482.7	28.8	760.2
291194	Asphalts other than paving and roofing grade -----do..	(S)	40.2	**1.6	46.7
2621B1	Roofing felts (unsaturated) -----1,000 s tons..	**426.8	87.5	629.2	148.4
322931	Glass fiber, roving, mats, etc. -----mil lb..	*273.7	294.9	158.2	228.3
329501	Roofing granules -----1,000 s tons..	4 034.3	286.6	2 592.1	181.4
144201	Sand and gravel -----do..	**2 257.2	46.7	(S)	22.1
970099	All other materials and components, parts, containers, and supplies -----	(X)	390.4	(X)	262.9
971000	Materials, containers, and supplies, n.s.k. <sup>2</sup> -----	(X)	231.9	(X)	111.6
	<b>INDUSTRY 2992, LUBRICATING OILS AND GREASES</b>				
	Materials, containers, and supplies -----	(X)	2 422.1	(X)	1 790.3
	Additives, except animal and vegetable oils:				
280011	Antioxidants, antiknock compounds, and inhibitors -----mil lb..	*267.6	138.5	*252.0	88.5
280012	Other additives, including soaps and detergents -----do..	387.9	351.9	251.5	136.0
207001	Animal and vegetable oils -----do..	(S)	31.0	**74.3	16.8
281980	Chemical catalytic preparations -----do..	(X)	1.9	(X)	(D)
281238	Sodium hydroxide (caustic soda, 100 percent NaOH) -----1,000 s tons..	**5.6	1.0	*10.4	2.3
281931	Sulfuric acid (100 percent H <sub>2</sub> SO <sub>4</sub> ), except spent -----do..	(S)	.1	(D)	(D)
	Containers:				
340001	Metal -----	(X)	110.1	(X)	71.4
260091	Paper and paperboard -----	(X)	38.8	(X)	20.0
308961	Plastics -----	(X)	149.9	(X)	( <sup>4</sup> )
265522	Fiber cans, bodies with combinations of fiber and other materials (foil, plastics, etc.) with metal ends -----	(X)	18.9	(X)	51.0
290004	Cost of materials received from petroleum refineries and lube manufacturers -----	(X)	785.8	(X)	762.6
970099	All other materials and components, parts, containers, and supplies -----	(X)	304.6	(X)	4302.3
971000	Materials, containers, and supplies, n.s.k. <sup>2</sup> -----	(X)	489.6	(X)	330.1

<sup>1</sup>For some establishments, data have been estimated from central unit values which are based on quantity-cost relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: \* 10 to 19 percent estimated; \*\* 20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by (S).

<sup>2</sup>Total cost of materials of establishments that did not report detailed materials data, including establishments that were not mailed a form.

<sup>3</sup>Data for 1987 and 1982 are not comparable due to a change in the definition for industry 2911 for the 1987 Census of Manufactures. An explanation of the Standard Industrial Classification revision appears in the Summary of Findings of this report.

<sup>4</sup>For 1982, material code 308961 was included with material code 970099.

Table 7b. **Fuels Produced and Consumed by Industry 2911, Petroleum Refining: 1987**

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

1987 mate- rial code	Fuel	Quantity	Sales value, f.o.b. plant <sup>1</sup> (million dollars)	1987 mate- rial code	Fuel	Quantity	Sales value, f.o.b. plant <sup>1</sup> (million dollars)
291004	Still gas.....mil cu ft..	964.2	2 240.3	291006	Mixed liquids.....1,000 bbl..	15.2	216.2
291005	Mixed fuel gas.....do..	295.2	710.4	960015	Other (distillate oils, petroleum, coke, etc.).....do..	(S)	(S)

<sup>1</sup>Manufacturers were instructed to estimate sales value, f.o.b. plant, for fuels produced and consumed in same establishment.



Table 8. **Employees Engaged in Construction and Value of Work Done: 1987**

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

SIC code	Industry	Total		Establishments reporting construction employees					Response coverage ratio C + A
		Employees (1,000)	Payroll (millions)	Total		Engaged in construction <sup>1</sup>			
				Employees (1,000)	Payroll (millions)	Employees (1,000)	Payroll (millions)	Value of work done (millions)	
		A	B	C	D	E	F	G	H
2911	Petroleum refining .....	74.6	2 845.5	21.3	878.8	4.7	175.6	442.3	.29

<sup>1</sup>Establishments in selected industries were instructed to report number of employees, included in total employment, that were engaged in construction, maintenance, or repair of the plant and utilized as a separate work force. Coverage ratio (column H) indicates proportion of industry employment represented by establishments that reported construction employees. Coverage ratio excludes (a) construction workers not employed by establishment (working under contract or provided by another establishment of the company), (b) establishments that reported having no construction employees, (c) establishments that did not respond to inquiry, and (d) establishments that were not mailed a form or from which a form had not been received at the time data were tabulated.





# APPENDIX A.

## Explanation of Terms

This appendix is in two sections. Section 1 includes items requested of all establishments mailed census of manufactures forms including annual survey of manufactures (ASM) forms. Note that this section also includes several items (number of establishments and companies, value added, classes of products, and specialization and coverage ratios) not included on the report forms but derived from information collected on the forms. Section 2 covers supplementary items requested only from establishments included in the ASM sample. Results of the supplementary ASM inquiries are included in table 3c of this report.

### SECTION 1. ITEMS COLLECTED OR DERIVED BASED ON ALL CENSUS OF MANUFACTURES (INCLUDING ASM) REPORT FORMS

**Number of establishments and companies**—As discussed in the Introduction, a separate report was required for each manufacturing establishment (plant) with one employee or more. An establishment is defined as a single physical location where manufacturing is performed. A company, on the other hand, is defined as a business organization consisting of one establishment or more under common ownership or control.

If the company operated at different physical locations, even if the individual locations were producing the same line of goods, a separate report was requested for each location. If the company operated in two or more distinct lines of manufacturing at the same location, a separate report was requested for each activity.

An establishment not in operation for any portion of the year was requested to return the report form with the proper notation in the "Operational Status" section of the form. In addition, the establishment was requested to report data on any employees, capital expenditures, inventories, or shipments from inventories during the year.

In this report, data are shown for establishments in operation at any time during the year. A comparison with the number of establishments in operation at the end of the year will be provided in the Introduction of the General Summary subject report.

**Employment and related items**—The report forms requested separate information on production workers for a specific payroll period within each quarter of the year and on other employees as of the payroll period which included the 12th of March.

**All employees**—This item includes all full-time and part-time employees on the payrolls of operating manufacturing establishments during any part of the pay period which included the 12th of the months specified on the report form. Included are all persons on paid sick leave, paid holidays, and paid vacations during these pay periods.

Officers of corporations are included as employees; proprietors and partners of unincorporated firms are excluded. The "all employees" number is the average number of production workers plus the number of other employees in mid-March. The number of production workers is the average for the payroll periods including the 12th of March, May, August, and November.

**Production workers**—This item includes workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), recordkeeping, and other services closely associated with these production operations at the establishment covered by the report. Employees above the working-supervisor level are excluded from this item.

**All other employees**—This item covers nonproduction employees of the manufacturing establishment including those engaged in factory supervision above the line-supervisor level. It includes sales (including driver salespersons), sales delivery (highway truck drivers and their helpers), advertising, credit, collection, installation and servicing of own products, clerical and routine office function, executive, purchasing, financing, legal, personnel (including cafeteria, medical, etc.), professional, and technical employees. Also included are employees on the payroll of the manufacturing establishment engaged in the construction of major additions or alterations to the plant and utilized as a separate work force.

In addition to reports sent to operating manufacturing establishments, information on employment during the payroll period which included March 12 and annual payrolls also was requested of auxiliary units (e.g., administrative offices, warehouses, and research and development laboratories) of multiestablishment companies. However, these figures are not included in the totals for individual



industries shown in this report. They are included in the general summary and geographic area reports as a separate category.

**Payroll**—This item includes the gross earnings of all employees on the payroll of operating manufacturing establishments paid in the calendar year 1987. Respondents were told they could follow the definition of payrolls used for calculating the Federal withholding tax. It includes all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. The total includes salaries of officers of corporations; it excludes payments to proprietors or partners of unincorporated concerns. Also excluded are payments to members of Armed Forces and pensioners carried on the active payroll of manufacturing establishments.

The census definition of payrolls is identical to that recommended to all Federal statistical agencies by the Office of Management and Budget. It should be noted that this definition does not include employers' Social Security contributions or other nonpayroll labor costs, such as employees' pension plans, group insurance premiums, and workers' compensation.

The ASM provides estimates of employers' supplemental labor costs, both those required by Federal and State laws and those incurred voluntarily or as part of collective bargaining agreements. (Supplemental labor costs are explained later in this appendix.)

As in the case of employment figures, the payrolls of separate auxiliary units of multiestablishment companies are not included in the totals for individual industries or industry groups.

**Production-worker hours**—This item covers hours worked or paid for at the plant, including actual overtime hours (not straight-time equivalent hours). It excludes hours paid for vacations, holidays, or sick leave.

**Cost of materials**—This term refers to direct charges actually paid or payable for items consumed or put into production during the year, including freight charges and other direct charges incurred by the establishment in acquiring these materials. It includes the cost of materials or fuel consumed, whether purchased by the individual establishment from other companies, transferred to it from other establishments of the same company, or withdrawn from inventory during the year.

The important components of this cost item are (1) all raw materials, semifinished goods, parts, containers, scrap, and supplies put into production or used as operating supplies and for repair and maintenance during the year, (2) electric energy purchased, (3) fuels consumed for heat, power, or the generation of electricity, (4) work done by

others on materials or parts furnished by manufacturing establishments (contract work), and (5) products bought and resold in the same condition. (See discussion of duplication of data below.)

**Specific materials consumed**—In addition to the total cost of materials, which every establishment was required to report, information also was collected for most manufacturing industries on the consumption of major materials used in manufacturing. The inquiries were restricted to those materials which were important parts of the cost of production in a particular industry and for which cost information was available from manufacturers' records. Information on the establishments consuming less than a specified amount (usually \$10,000) of a specific material were not requested to report consumption of that material separately. Also, the cost of materials for the small establishments for which either administrative records or short forms were used was imputed as "not specified by kind." (See the introduction for the importance of administrative records in the industry.)

**Value of shipments**—This item covers the received or receivable net selling values, f.o.b. plant (exclusive of freight and taxes), of all products shipped, both primary and secondary, as well as all miscellaneous receipts, such as receipts for contract work performed for others, installation and repair, sales of scrap, and sales of products bought and resold without further processing. Included are all items made by or for the establishments from materials owned by it, whether sold, transferred to other plants of the same company, or shipped on consignment. The net selling value of products made in one plant on a contract basis from materials owned by another was reported by the plant providing the materials.

In the case of multiunit companies, the manufacturer was requested to report the value of products transferred to other establishments of the same company at full economic or commercial value, including not only the direct cost of production but also a reasonable proportion of "all other costs" (including company overhead) and profit. (See discussion of duplication of data below.)

**Individual products**—As in previous censuses, data were collected for most industries on the quantity and value of individual products shipped. In the 1987 census program, information was collected on the output of approximately 11,000 individual product items. The term "product", as used in the census of manufactures, represents the finest level of detail for which output information was requested. Consequently, it is not necessarily synonymous with the term "product" as used in the marketing sense. In some cases, it may be much more detailed and, in other cases, it is more aggregative. For example, "pharmaceutical preparations" was distributed into over 100 terms; whereas, "motor gasoline" was reported as a single item.

Approximately 6,600 of the product items were listed separately on the 1987 census report forms. Data for



about 4,400 products were obtained in the monthly, quarterly, or annual surveys comprising the Current Industrial Reports series of the Census Bureau. Totals for the year 1987 for these items, as derived from the commodity surveys, are shown in the "products shipped" table (table 6a-2).

The list of products for which separate information was collected was prepared after consultation with industry and government representatives. Comparability with previous figures was given considerable weight in the selection of product categories so that comparable 1982 information is presented for most products.

Typically, both quantity and value of shipments information were collected. However, if quantity was not significant or could not be reported by manufacturers, only value of shipments was collected.

Shipments include both commercial shipments and transfers of products to other plants of the same company. For industries in which a considerable portion of the total shipments is transferred to other plants of the same company, separate information on interplant transfers also was collected. Moreover, for products that are used to a large degree within the same establishment as materials or components in the fabrication of other products, total production and often consumption of the item within the plant was collected. Typically, the information on production also was collected for products for which there are significant differences between total production and shipments in a given year because of wide fluctuations in finished goods inventories. Other measures of output of products with long production cycles were used as appropriate and feasible.

**Classes of products**—To summarize the product information, the separate products were aggregated into classes of products that, in turn, were grouped into all primary products of each industry. The code structure used is a seven-digit number for the individual product, a five-digit number for the class of product, and a four-digit number for the total primary products in an industry. (See Introduction, Industry Classification of Establishments, for application of the coding structure to the assignment of SIC codes for establishments.)

In the 1987 census, the 11,000 products were grouped into approximately 1,500 separate classes on the basis of general similarity of manufacturing processes, types of materials used, and the like. However, the grouping of products was affected by the economic significance of the class and, in some cases, dissimilar products were grouped because the products were not sufficiently significant to warrant separate classes.

**Duplication in cost of materials and value of shipments**—The aggregate of the cost of materials and value of shipments figures for industry groups and for all manufacturing industries includes large amounts of duplication since the products of some industries are used as materials by others. This duplication results, in part, from the

addition of related industries representing successive stages in the production of a finished manufactured product. Examples are the addition of flour mills to bakeries in the food group and the addition of pulp mills to paper mills in the paper and allied products group of industries. Estimates of the overall extent of this duplication indicate that the value of manufactured products exclusive of such duplication (the value of finished manufactures) tends to approximate two-thirds of the total value of products reported in the annual survey.

Duplication of products within individual industries is significant within a number of industry groups, e.g., machinery and transportation industries. These industries frequently include complete machinery and their parts. In this case, the parts made for original equipment are materials consumed for assembly plants in the same industry.

Even when no significant amount of duplication is involved, value of shipments figures are deficient as measures of the relative economic importance of individual manufacturing industries or geographic areas because of the wide variation in ratio of materials, labor, and other processing costs of value of shipments, both among industries and within the same industry.

Before 1962, cost of materials and value of shipments were not published for some industries which included considerable duplication. Since then, these data have been published for all industries at the United States level and beginning in 1964, for all geographic levels.

**Value added by manufacture**—This measure of manufacturing activity is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (i.e., the difference between the sales value and the cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process between the beginning- and end-of-year inventories.

For those industries where value of production is collected instead of value of shipments (see footnote in table 1a), value added is adjusted only for the change in work-in-process inventories between the beginning and end of year. For those industries where value of work done is collected, the value added does not include an adjustment for the change in finished goods or work-in-process inventories.

"Value added" avoids the duplication in the figure for value of shipments that results from the use of products of some establishments as materials by others. Value added is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries and geographic areas.

**New and used capital expenditures**—For establishments in operation and any known plants under construction, manufacturers were asked to report their new expenditures for (1) permanent additions and major alterations to



manufacturing establishments, and (2) machinery and equipment used for replacement and additions to plant capacity if they were of the type for which depreciation accounts were ordinarily maintained.

The totals for new expenditures include expenditures leased from nonmanufacturing concerns through capital leases, new facilities owned by the Federal Government but operated under contract by private companies, and plant and equipment furnished to the manufacturer by communities and nonprofit organizations. Also excluded are expenditures for used plant and equipment (although reported in the census), expenditures for land, and cost of maintenance and repairs charged as current operating expenses.

Manufacturers also were requested to report the value of all used buildings and equipment purchased during the year at the purchase price. For any equipment or structure transferred for the use of the reporting establishment by the parent company or one of its subsidiaries, the value at which it was transferred to the establishment was to be reported. Furthermore, if the establishment changed ownership during the year, the cost of the fixed assets (building and equipment) was to be reported under used capital expenditures.

Total expenditures for used plant and equipment is a universe figure; it is collected on all census forms. However, the breakdown of this figure between expenditures for used buildings and other structures and expenditures for used machinery and equipment is collected only on the ASM form. The data for total new capital expenditures, new building expenditures, and new machinery expenditures, as well as the data for total used expenditures, are shown in table 3b.

**End-of-year inventories**—Respondents were asked to report their 1986 and 1987 end-of-year inventories at cost or market. Effective with the 1982 Economic Censuses, this change to a uniform instruction for reporting inventories was introduced for all sector reports. Prior to 1982, respondents were permitted to value inventories using any generally accepted accounting method (FIFO, LIFO, market, to name a few). In 1982, LIFO users were asked to first report inventory values prior to the LIFO adjustment and then to report the LIFO reserve and the LIFO value after adjustment for the reserve.

## SECTION 2. ITEMS COLLECTED ONLY ON ASM REPORT FORMS

The following items were collected only from establishments included in the ASM sample:

1. **Supplemental labor costs**—Supplemental labor costs are divided into legally required expenditures and payments for voluntary programs. The legally required portion consists primarily of Federal old age and survivors' insurance, unemployment compensation, and workers' compensation. Payments for voluntary programs include all programs not

Because of this change in reporting instructions, the 1982 through 1987 data for inventories and value added by manufacture included in the tables of this report are not comparable to the prior-year data shown in table 1a of this report and in historical census of manufactures and annual survey of manufactures publications.

In using inventory data by stage of fabrication for "all industries" and at the two-digit industry level, it should be noted that an item treated as a finished product by an establishment in one industry may be reported as a raw material by another establishment in a different industry. For example, the finished-product inventories of a steel mill would be reported as raw materials by a stamping plant. Such differences are present in the inventory figures by stage of fabrication shown for individual industries, industry groups, and "all manufacturing", which are aggregates of figures reported by establishments in specified industries.

**Specialization and coverage ratios**—These items are not collected on the report forms but are derived from the data shown in table 5b. An establishment is classified in a particular industry if its shipments of primary products of that industry exceed in value its shipments of the products of any other single industry.

As noted in the introduction, an establishment's shipments include those products assigned to an industry (primary products), those considered primary to other industries (secondary products), and receipts for miscellaneous activities (merchandising, contract work, resales, etc.). Specialization and coverage ratios have been developed to measure the relationship of primary product shipments to the data on shipments for the industry shown in tables 1a through 5a and data on product shipments shown in tables 6a through 6c.

Specialization ratio represents the ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for the establishments classified in the industry.

Coverage ratio represents the ratio of primary products shipped by the establishments classified in the industry to the total shipments of such products that are shipped by all manufacturing establishments wherever classified.

specifically required by legislation whether they were employer initiated or the result of collective bargaining. They include the employer portion of such plans as insurance premiums, premiums for supplemental accident and sickness insurance, pension plans, supplemental unemployment compensation, welfare plans, stock purchase plans on which the employer payment is not subject to withholding tax, and deferred profit-sharing plans.



They exclude such items as company-operated cafeterias, in-plant medical services, free parking lots, discounts on employee purchases, and uniforms and work clothing for employees. While the excluded items do benefit employees and all or part of their cost generally is similar to the items covered in the ASM labor costs statistics, accounting records generally do not provide reliable figures on net employee benefits of these types.

2. **Retirements of depreciable assets**—Included in this item is the gross value of assets sold, retired, scrapped, destroyed, etc., during 1987. When a complete operation or establishment changed ownership, the respondent was instructed to report the value of the assets sold at the original cost as recorded in the books of the seller. The respondent also was requested to report retirements of equipment or structures owned by a parent company that the establishment was using as if it were a tenant.
3. **Depreciation charges for fixed assets**—This item includes depreciation and amortization charged during the year against assets. Depreciation charged against fixed assets acquired since the beginning of the year and against assets sold or retired during the year are components of this category. Respondents were requested to make certain that they did not report accumulated depreciation.
4. **Rental payments**—Total rental payments is collected on all census forms. However, the breakdown between rental payments for buildings and other structures and rental payments for machinery and equipment is collected only on the ASM forms. This item includes rental payments for the use of all items for which depreciation reserves would be maintained if they were owned by the establishment, e.g., structures and buildings, and production, office, and transportation equipment. Excluded are royalties and other payments for the use of intangibles and depletable assets, and land rents where separable.

When an establishment of a multiestablishment company was charged rent by another part of the same company for the use of assets owned by the company, it was instructed to exclude that cost from rental payments. However, the book value (original cost) of these company-owned assets was to be reported as assets of the establishment at the end of the year.

If there were assets at an establishment rented from another company and the rents were paid centrally by the head office of the establishment, the company was instructed to report these rental payments as if they were paid directly by the establishment.

5. **Depreciable assets**—Total value of gross depreciable assets is collected on all census forms.

However, the detail for depreciable assets is collected only on the ASM forms. The data encompass all fixed depreciable assets on the books of establishments at the beginning and end of the year. The values shown (book value) represent the actual cost of assets at the time they were acquired, including all costs incurred in making the assets usable (such as transportation and installation). Included are all buildings, structures, machinery, and equipment (production, office, and transportation equipment) for which depreciation reserves are maintained. Excluded are nondepreciable capital assets, including inventories and intangible assets, such as timber and mineral rights.

The definition of fixed depreciable assets is consistent with the definition of capital expenditures. For example, expenditures include actual capital outlays during the year, rather than the final value of equipment put in place and buildings completed during the year. Accordingly, the value of assets at the end of the year includes the value of construction in progress. In addition, respondents were requested to make certain that assets at the beginning of the year plus new and used capital expenditures, less retirements, equalled assets at the end of the year.

6. **New and used capital expenditures**—The data for total new capital expenditures, new building expenditures, new machinery expenditures, and total used capital expenditures are collected on all census forms. However, the breakdown between expenditures for used buildings and other structures and expenditures for used machinery and equipment is collected only on the ASM form. (See further explanation on capital expenditures in section 1.)
7. **Quantity of electric energy consumed for heat and power**—Data on the cost of purchased electric energy were collected on all census forms. However, data on the quantity of purchased electric energy were collected only on the ASM forms. In addition, information was collected on the quantity of electric energy generated by the establishment and the quantity of electric energy sold or transferred to other plants of the same company.
8. **Breakdown of new capital expenditures for machinery and equipment**—ASM establishments were requested to separate their capital expenditures for new machinery and equipment into (1) automobiles, trucks, etc., for highway use, (2) computers and peripheral data processing equipment, and (3) all other.

The category “automobiles, trucks, etc., for highway use” is intended to measure expenditures for vehicles designed for highway use that were acquired through a purchase or lease-purchase agreement.



Vehicles normally operating off public highways (vehicles specifically designed to transport materials, property, or equipment on mining, construction, logging, and petroleum development projects) are excluded from this item.

9. **Foreign content of cost of materials**—Establishments included in the ASM sample panel were requested to provide information on foreign-made materials purchased or transferred from foreign sources. This includes materials acquired from a central warehouse or other domestic establishment of the same company but made in an operation outside of the 50 States, District of Columbia, Puerto Rico, or U.S. territories.
10. **Cost of purchased services**—ASM establishments were requested to provide information on the cost of purchased services for the repair of buildings and other structures, the repair of machinery, and communication services. Included in the cost of purchased services for the repair of buildings and machinery are payments made for all maintenance and repair work on buildings and equipment, such as painting, roof repairs, replacing parts, and overhauling equipment. Such payments made to other establishments of the same company and for repair and maintenance of any leased property also are included. Extensive repairs or reconstruction that were capitalized are considered capital expenditures for used buildings and machinery and are, therefore, excluded from this item. Repair and maintenance costs provided by an owner as part of a rental contract or incurred directly by an establishment in using its own work force also are excluded.

Three basic approaches were utilized to produce these statistics.

1. For items 1 through 6, data were estimated (imputed) for all non-ASM establishments using the available data in the establishment record and industry-based parameters. The statistics were then generated by simply tabulating all census records including the imputed value for non-ASM establishments and the unweighted value for ASM establishments. Separate imputation rates were developed and are shown in the table. For quantity of purchased electricity for heat and power (item 7), a similar procedure was used; however, the imputation parameters were geographically-based instead of industry-based. For quantities of generated less sold electricity, no imputation was performed for non-ASM establishments. The estimates for these items are simply tabulations of unweighted ASM values.

Since the published statistics for these items were developed from the complete census universe and not just the ASM establishments, there are no sampling variances associated with these statistics. However, there is an unknown level of bias for each of the items due to the imputation of the non-ASM establishments. This bias is felt to be small due to the strong correlation between the items being imputed and the collected items that were used to generate the impute values.

2. For items 8 and 9, the estimates were developed using a ratio estimation methodology. For item 8, an estimate of the breakout of new capital expenditures for machinery and equipment into the three categories was made from ASM establishments reporting these categories. The estimated proportions were then applied to the corresponding Census value for new capital expenditures for machinery and equipment to produce the estimates.

The estimates for item 9, foreign content of cost of materials, were developed in a similar manner based on costs of parts, supplies, and components (item 5a) as the control total for the three categories.

For items 8 and 9, an adjustment ratio of the following form was computed.

$$R_j = \frac{NM_c}{TME_{asm}}$$

where:

$NM_c$  = the census value of new capital expenditures for machinery and equipment

$TME_{asm}$  = the weighted ASM value of new capital expenditures for machinery and equipment from reporters of the detailed breakout data

3. For item 10, cost of purchased services, the estimates were made by simply tabulating weighted data for all the ASM records that reported the item. A response coverage ratio (a measure of the extent to which respondents reported for each item) is shown in table 3c for the three types of services. It is derived for each item by calculating the ratio of the weighted employment (establishment data multiplied by sample weight, see appendix B) for those ASM establishments that reported the specific inquiry to the weighted total employment for all ASM establishments classified in the industry.



# **APPENDIX B.**

## **Annual Survey of Manufactures (ASM) Sampling and Estimating Methodologies**

### **DESCRIPTION OF SURVEY SAMPLE**

The Annual Survey of Manufactures (ASM) contains two components. The mail portion of the survey is a probability sample of about 56,000 manufacturing establishments selected from a total of about 220,000 establishments. These 220,000 establishments represent all manufacturing establishments of multiunit companies and all single establishment companies mailed schedules in the 1982 Census of Manufactures. This mail portion is supplemented annually by a Social Security Administration list of new manufacturing establishments opened after 1982 and a list of new multiunit manufacturing establishments identified from the Census Bureau's Company Organization Survey.

The 1984 through 1988 ASM sample differs slightly from the previous sample. For the current panel, all establishments of companies with 1982 shipments in manufacturing in excess of \$500 million were included in the survey panel with certainty. There are approximately 500 such companies collectively accounting for approximately 18,000 establishments. For the remaining portion of the mail survey, the establishment was defined as the sampling unit. For this portion, all establishments with 250 employees or more and establishments with a very large value of shipments also were included in the survey panel with certainty. A total of 12,100 establishments were selected from this portion of the universe with certainty. Therefore, of the 56,000 manufacturing establishments included in the ASM panel, approximately 31,000 are selected with certainty. These certainty establishments collectively account for approximately 80 percent of the total value of shipments in the 1982 census.

Smaller establishments in the remaining portion of the mail survey were sampled with probabilities ranging from 0.999 to 0.005 in accordance with mathematical theory for optimum allocation of a sample. The probabilities of selection assigned to the smaller establishments were proportional to measures of size determined for each establishment. The measures of size depend directly upon each establishment's 1982 product class values and the historic variability of the year-to-year shipments of each product class. Product classes displaying more volatile year-to-year change in shipments at the establishment level were sampled at a heavier rate.

This method of assigning measures of size was used in order to maximize the precision (that is, minimize the variance of estimates of the year-to-year change) in the value of product class shipments. Implicitly, it also gave weight differences in employment, value added, and other

general statistics, since these are highly correlated with value of shipments. Individual sample selection probabilities were obtained by multiplying each establishment's final measure of size by an overall sampling fraction coefficient calculated to yield a total expected sample size.

The sample selection procedure gave each establishment in the sampling frame an independent chance of selection. This method of independent selection permits the rotation of small establishments out of a given sample panel without introducing a bias into the survey estimates.

The nonmail portion of the survey includes all single-establishment companies that were tabulated as administrative records in the 1982 Census of Manufactures. Although this portion contained approximately 130,000 establishments, it accounted for less than 2 percent of the estimate for total value of shipments at the total manufacturing level. This portion was not sampled; rather, the data for every establishment in this group were estimated based on selected information obtained annually from the administrative records of the Internal Revenue Service and the Social Security Administration. This administrative-record information, which includes payroll, total employment, industry classification, and physical location of the establishment, was obtained under conditions which safeguard the confidentiality of both tax and census records. Estimates of data other than payroll and employment for these small establishments were developed from industry averages.

The corresponding estimates for the mail and nonmail establishments were added together, along with the base-year differences, as defined in the Description of Estimating Procedure section, to produce the figures shown in this publication.

### **DESCRIPTION OF ESTIMATING PROCEDURES**

Most of the ASM estimates for the years 1983-1986 were computed using a difference estimation procedure. For each item, a base-year difference was developed. This base-year difference is equal to the difference between the 1982 census published number for an item total and the linear ASM estimate of the total for 1982. The ASM linear estimate was obtained by multiplying each sample establishment's data by its sample weight (the reciprocal of its probability of selection) and summing the weighted values.

These base-year differences were then added to the corresponding current-year linear estimates, which include the sum of the estimates for the mail and nonmail establishments, to produce the estimates for the years 1983-1986. Estimates developed by this procedure usually are far more reliable than comparable linear estimates developed from the current sample data alone.



The 1987 sample estimates for the purchased service items, shown in table 3c, are strictly ASM linear estimates, however, developed only from ASM establishments that reported the specific item.

The remaining estimates in table 3c, showing the breakdown of expenditures for new machinery and equipment and costs of parts (separated into purchases from foreign sources and purchases from domestic sources), were computed as ratio estimates. To do this, linear estimates of the new machinery detail items were developed from the ASM establishments and were ratio adjusted to the corresponding census total for new machinery. In a similar fashion, the ASM linear estimates of the detailed purchased materials items were ratio adjusted to the corresponding census total for cost of parts.

## QUALIFICATIONS OF THE DATA

The estimates developed from the sample are apt to differ somewhat from the results of a survey covering all companies in the sampled lists but otherwise conducted under essentially the same conditions as the actual sample survey. The estimates of the magnitude of the sampling errors (the differences between the estimates obtained and the results theoretically obtained from a comparable, complete-coverage survey) are provided by the standard errors of the estimates.

The particular sample selected for the ASM is one of a large number of similar probability samples that, by chance, might have been selected under the same specifications. Each of the possible samples would yield somewhat different sets of results, and the standard errors are measures of the variation of all the possible sample estimates around the theoretical, comparable, complete-coverage values.

Estimates of the standard errors have been computed from the sample data for selected statistics in this report. They are presented in the form of relative standard errors (the standard errors divided by the estimated values to which they refer).

In conjunction with its associated estimate, the relative standard error may be used to define confidence intervals (ranges that would include the comparable, complete-coverage value for specified percentages of all the possible samples).

The complete coverage value would be included in the range:

1. From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.
2. From two standard errors below to two standard errors above the derived estimate for about 19 of 20 of all possible samples.
3. From three standard errors below to three standard errors above the derived estimate for nearly all samples.

An inference that the comparable, complete-survey result would be within the indicated ranges would be correct in approximately the relative frequencies shown. Those proportions, therefore, may be interpreted as defining the confidence that the estimates from a particular sample would differ from complete-coverage results by as much as one, two, or three standard errors, respectively.

For example, suppose an estimated total is shown as 50,000 with an associated relative standard error of 2 percent, that is, a standard error of 1,000 (2 percent of 50,000). There is approximately 67 percent confidence that the interval 49,000 to 51,000 includes the complete-coverage total, about 95 percent confidence that the interval 48,000 to 52,000 includes the complete-coverage total and almost certain confidence that the interval 47,000 to 53,000 includes the complete coverage total.

In addition to the sample errors, the estimates are subject to various response and operational errors: errors of collection, reporting, coding, transcription, imputation for nonresponse, etc. These operational errors also would occur if a complete canvass were to be conducted under the same conditions as the survey. Explicit measures of their effects generally are not available. However, it is believed that most of the important operational errors were detected and corrected in the course of the Bureau's review of the data for reasonableness and consistency. The small operational errors usually remain. To some extent, they are compensating in the aggregated totals shown. When important operational errors were detected too late to correct the estimates, the data were suppressed or were specifically qualified in the tables.

As derived, the estimated standard errors included part of the effect of the operational errors. The total errors, which depend upon the joint effect of the sampling and operational errors, are usually of the order of size indicated by the standard error, or only moderately higher. However, for particular estimates, the total error may considerably exceed the standard errors shown.

The concept of complete coverage under the conditions prevailing for the ASM is not identical to the complete coverage of the census of manufactures, as the censuses have been conducted. Nearly all types of operational errors that affect the ASM also occur in the censuses. The ASM and the censuses, are conducted under quite different conditions, and operational errors can be better controlled in the ASM than in the censuses. As a result, for many of the census figures, the errors are of the same order of size as the total errors of the corresponding annual survey estimates. The differences between the census and ASM operating conditions also disturb, to some degree, the comparability of the ASM and census data.

Any figures shown in the tables in this publication having an associated standard error exceeding 15 percent may be of limited reliability. However, the figure may be combined with higher-level totals, creating a broader aggregate, which then may be of acceptable reliability.



# APPENDIX C.

## Changes in Census of Manufactures

### Product Classes for 1987

[Based on revisions to the Standard Industrial Classification (SIC) Manual definitions of some product classes were revised for 1987. Listed below are the revisions to the product classes]

1987	1982	1987	1982	1987	1982	1987	1982
2011B	2011A 2013A pt	20866—Con.	20861 pt—Con. 20995 pt	2221F—Con.	22211 pt—Con. 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23259—Con.	23279—Con. 23289 pt
20135	20130	20910	20324 pt 20910			23260	23280
2013B	2013A pt					23261	23281
20150	20160 20170	20925 20926	20924	2221G	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23262	23284
20151	20161 20171	20961 20962 20963	20992			23269	23289 pt
20152	20162 20172	20980	20981 pt			23293	23271 pt 23292
20153	20163 20173	20997	20341 pt 20440 pt 20982 2099A pt	2221H	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23530	23510 pt 23520
20154	20164 20174	20999	2099B pt			23531	23521
20155	20165 20175	2099D	20995 pt			23532	23522
20159	20179	2099E 2099F 2099G	2099C 20981 pt	2221J	22218	23533	23510 pt
20226	20220			2221K	22219	23692	23631
20239	20239 2099A pt	2211B	22111 pt 22112 pt 22113 pt 22114 pt 22115 pt 22116 pt	2221M	2221A	23693	23691
20267	20266 pt 2099B pt			22510	22510 pt	23699	23619 23699
20268	20266 pt 2099B pt	2211C	22111 pt 22112 pt 22113 pt 22114 pt 22115 pt 22116 pt	22514	22512 pt	23813	23811 pt 23812 pt
20324	20324 pt			22518	22517 pt	23814	23811 pt 23812 pt
20343	20341 pt			22520	22510 pt 22520	23952	23951 pt
20380	20380 pt	2211D	22111 pt 22112 pt 22113 pt 22114 pt 22115 pt 22116 pt	22525	22512 pt 22523	23958	23959
20384	20381 pt 20383 pt			22526	22517 pt 22524	23964	23951 pt
20415	20383 pt 20415	2211E	22111 pt 22112 pt 22113 pt 22114 pt 22115 pt 22116 pt	22585	22920 pt	24930	24920 pt 26610
20440	20440 pt			22589	22589 22920 pt	24931	24920 pt
20450	20383 pt 20450			22730	22710 pt 22720 pt 22790 pt	24932	24920 pt
20470	20470 pt	2211F	22117			24933	24993
20480	20470 pt 20480	2211G	22119	22731	22710 pt	24934	24996
2048A	20475 20476	2211H	2211A	22732	22720 pt	24935	26611
20530	20380 pt 20381 pt	2221B	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	22733	22790 pt	24936	24998
20640	20650 pt					24937	24995
20642	20652	2221C	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	22815	22833	24994	2499A pt
20643	20653			22822	22822 22830	25115	25115 25158
20649	20659			22991	22910	25145	25141 25142
20660	20660 20990 pt	2221D	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	22994	22940	25146	25143
20669	20668 20998			22995	22930	25147	25144
20680	20341 pt 20650 pt 20657			22996	22992 22993	25425 25991 25992 25994	25990
20863 20864 20865	20861 pt	2221E	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23219	23219 pt	2621B	26612
20866	20861 pt 20862	2221F	22211 pt	23221	23220	26560	26540
				23222	23215	26561	26541
				23229	23219 pt 23229	26562	26542
				23250	23270	26563	26545
				23251	23271 pt	26570	26510 26544
				23252	23283		
				23259	23279		

[Based on revisions to the Standard Industrial Classification (SIC) Manual definitions of some product classes were revised for 1987. Listed below are the revisions to the product classes]

1987	1982	1987	1982	1987	1982	1987	1982
26710	26410 pt	26753	26455	27591	27511 pt	28350—Con. 28351 28352	2831A—Con.
26711	26415	26760	26470	27592	27512 pt		
26712	26416	26761	26471	27593	27513 pt	28360	28310
26713	26419	26763	26473	27594	27514 pt	28361	28311
26714	2641A	26764	26474	27595	27515 pt	28362	28312
26720	26410 pt	26770	26420	27596	27516 pt	28363	28317
26721	26411	26780	26480	27597	27511 pt 27512 pt 27513 pt 27514 pt 27515 pt 27516 pt	28364	28318 28319
26722	26413	26781	26481			28656	2911C
26723	26414	26782	26482			28691	2911B
26724	2641B	26790	26460 pt 26490			28916 28917	28915
26730	26430 pt	26791	26493	27598	27519		
26731	26435	26792	26494	27599	27531		
26732	26436	26793	26496	2759A	27510 pt	2911D	2911D pt
26733	26437	26794	26460 pt	27960	27530 27950	29990	2911D pt 29990
26740	26430 pt	26795	26497	27961	27951 35557 pt	31430	31430 31433 31434 31435
26741	26434	27416 27417	27411	27962	27952		
26742	26438	27418	27412	27963	27532 27547 27930 27940	31440	31440 31445 31446 31447 31448
26750	26450	27419	27414	28247	28243 28245	31490	31490 31491 31493 31495 31496 31497
26751	26453	2741A 2741B	27415	28248	28246		
26752	26454	27590	27510 pt	28350	2831A		



APPENDIX D.

Changes in Census of Manufactures

Product Codes for 1987

[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product codes were revised for 1987. Listed below are the revisions to the product codes. The terms published and collected are defined as follows: (1) published refers to the code used in the published reports for 1987 and 1982, and (2) collected refers to the code appearing on the report forms for 1987]

1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
20119 14	20119 14	20119 12 20119 13	20159 17	20179 17	20179 17	20343 21	20341 21	20341 21	20488 21	20488 21	20488 18
2011B 15	2011B 15	2011A 15	20159 51	20179 51	20179 51	20343 23	20341 23	20341 23	20488 23	20488 23	20488 17 pt
			20159 53	20179 53	20179 53	20343 29	20341 29	20341 2^	20488 25	20488 25	20488 19 pt
2011B 41	2011B 41	2011A 41	20159 55	20179 55	20179 55	20343 31	20341 31	20341 32 20341 33 20341 35	20488 31	20488 31	20488 17 pt
2011B 55	2011B 55	2011A 55							20488 33	20488 33	20488 19 pt
2011B 99	2011B 99	2011A 31 2011A 51	20159 57	20179 57	20179 57	20352 31 20352 34	20352 31 20352 34	20352 33	2048A 01	20475 35	20475 35
20135 13 20135 17	20135 13 20135 17	20130 00	20226 00	20220 11	20220 00				2048A 03	20475 52	20475 52
20151 33	20161 33	20161 33	20235 22	20235 22	20235 28 pt	20354 35	20354 35	20354 31 20354 33 20354 39	2048A 05	20476 61	20476 61
									2048A 07	20476 63	20476 63
20151 34	20161 34	20161 34	20235 29	20235 29	20235 21 20235 28 pt	20382 26 20382 28	20382 26 20382 28	20382 27	2048A 09	20476 65	20476 65
20151 36	20161 36	20161 36	20239 23	20239 23	20239 29 pt	20384 51	20383 51	20383 51	2048A 11	20476 67	20476 67
20151 39	20161 39 20171 39	20161 39 20171 39	20239 25	2099A 12	2099A 11 pt				20384 59	20383 59	20383 59
20151 41	20161 41 20171 41	20161 41 20171 41	20239 28	20239 28	20239 29 pt	20384 63	20383 63	20381 18	20512 39 20512 40 20512 42	20512 39 20512 40 20512 42	20512 38
20152 21	20162 21 20172 21	20162 21 20172 21	20240 31	20240 31	20240 98 pt	20411 26	20411 26	20411 24 20411 25	20530 11	20381 11	20381 11
20152 23	20162 23 20172 23	20162 23 20172 23							20412 19	20412 19	20412 00 20412 17
20153 22	20163 22 20173 22	20163 21 pt 20173 21 pt	20240 52 20240 54	20240 52 20240 54	20240 51	20415 91 20415 93	20383 65 20383 66	20383 61	20530 14	20381 14	20381 14
									20530 17	20381 17	20381 17
20153 24	20163 24 20173 24	20163 23 pt 20173 23 pt	20240 99	20240 99	20240 98 pt	20430 21 20430 23	20430 21 20430 23	20430 19	20530 19	20381 19	20381 19
20153 26	20163 26 20173 26	20163 25 pt 20173 25 pt	20267 11	2099B 11	2099B 11	20430 55	20430 55	20430 52 pt	20642 00	20652 00	20652 00
			20267 13	2099B 13	2099B 13				20643 00	20653 00	20653 00
20153 27	20163 27  20173 27	20163 21 pt 20163 23 pt 20163 25 pt 20173 21 pt 20173 23 pt 20173 25 pt	20267 14 20267 16	2099B 14 2099B 16	2099B 19 pt	20430 57	20430 57	20430 53 pt	20649 21	20659 21	20659 21
			20267 17	20267 17	20266 17	20430 61	20430 61	20430 59 pt	20649 76	20659 76	20659 76
20153 28	20163 28 20173 28	20163 27 pt 20173 27 pt	20267 18	2099B 18	2099B 19 pt	20430 63	20430 63	20430 52 pt 20430 53 pt 20430 59 pt	20669 11	20668 11 20998 11	20668 11 20998 11
			20268 13	2099B 51	2099B 51				20669 21	20668 21 20998 21	20668 21 20998 21
20154 14	20164 14 20174 14	20164 14 20174 14	20268 15	20268 15	20266 15	20450 91 20450 93	20383 67 20383 68	20383 61	20669 63	20668 63 20998 63	20668 63 20998 63
20154 16	20164 16 20174 16	20164 16 20174 16	20268 19	20268 19	20266 19	20464 72 20464 75	20464 72 20464 70	20464 69	20669 71	20668 71 20998 71	20669 71 20998 71
20155 11	20165 11 20175 11	20165 11 20175 11	20324 97 20324 99	20324 97 20324 99	20324 98	20481 21	20481 21	20481 13 pt	20669 75	20668 75 20998 75	20668 75 20998 75
20155 13	20165 13 20175 13	20165 13 20175 13	20331 13	20331 13	20331 71				20481 22	20481 22	20481 17 pt
20155 15	20165 15 20175 15	20165 15 20175 15	20331 32	20331 32	20331 72	20481 23	20481 23	20481 26 pt	20669 92	20668 92 20998 92	20668 92 20998 92
			20331 36	20331 36	20331 73				20669 93	20668 93 20998 93	20668 93 20998 93
20155 31	20165 31 20175 31	20165 31 20175 31	20331 38	20331 38	20331 74	20481 24	20481 24	20481 28 pt	20669 95	20668 95 20998 95	20668 95 20998 95
20155 32	20165 32 20175 32	20165 32 20175 32	20331 41	20331 41	20331 75				20481 32	20481 32	20481 17 pt
20155 33	20165 33 20175 33	20165 33 20175 33	20332 05	20332 05	20332 08 20332 09 20332 92	20481 33	20481 33	20481 26 pt	20680 13	20657 13	20657 13
			20332 37	20332 37	20332 96				20680 15	20657 15	20657 15
20155 34	20165 34 20175 34	20165 34 20175 34	20336 14	20336 14	20336 13	20487 05 20487 06	20487 05 20487 06	20487 00	20680 17	20657 17	20657 17
20155 39	20165 39 20175 39	20165 39 20175 39	20343 13	20341 13	20341 13	20488 11	20488 11	20488 14	20680 33	20657 33	20657 33
20155 48	20165 48 20175 48	20165 48 20175 48	20343 15	20341 15	20341 15				20488 12 20488 13	20488 12 20488 13	20488 15
20159 11	20179 11	20179 11	20343 18	20341 18	20341 18						
20159 13	20179 13	20179 13									
20159 15	20179 15	20179 15									



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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published								
20680 37	20657 37	20657 37	20863 20— Con.	20863 20— Con.	20863 01— Con.	20922 27	20922 27	20922 29	2099E 33	2099E 33	2099C 33								
20680 53	20657 53	20657 53			20863 36 20863 37	20922 28 20922 31		2099E 38	2099E 38	2099C 38									
20680 55	20657 55	20657 55			20863 38 20863 39	20923 11 20923 13	20923 21	2099E 39	2099E 39	2099C 39									
20680 57	20657 57	20657 57			20863 42 20863 44			2099F 44	2099F 44	2099C 44									
20680 61	20657 61	20657 61			20863 45 20863 47	20923 15 20923 17	20923 22	2099F 46	2099F 46	2099C 46									
20740 98	20740 98	20740 00	20863 30	20863 30	20861 01 pt 20861 03 pt 20861 07 pt 20861 10 pt 20861 11 pt 20861 12 pt 20861 13 pt 20861 14 pt 20861 15 pt 20861 16 pt	20923 19	20923 19	20923 23	2099G 11	2099G 11	2099C 11								
20750 98	20750 98	20750 00			20923 31 20923 33	20923 31 20923 33	20923 26	2099G 25	2099G 25	2099C 25									
20760 94	20760 94	20760 00			20923 35	20923 35	20923 28 20923 29	2099G 51	2099G 51	2099C 51									
20760 95	20760 95							2099G 85	2099G 85	2099C 85									
20760 96	20760 96				20925 21	20925 21	20924 21	2099G 91	2099G 91	2099C 91									
20760 97	20760 97							2099G 98	2099G 98	2099C 98									
20760 98	20760 98				20925 22	20925 22	20924 22	2211B 00	2211B 00	22111 00 pt 22112 00 pt 22113 00 pt 22114 10 pt 22114 50 pt 22115 00 pt 22116 00 pt									
20821 01	20821 01	20821 14 20821 19 pt			20925 23	20925 23	20924 33 pt				2211C 00	2211C 00	22111 00 pt 22112 00 pt 22113 00 pt 22114 10 pt 22114 50 pt 22115 00 pt 22116 00 pt						
20821 02	20821 02	20821 15 20821 19 pt			20925 24	20925 24	20924 24							2211D 00	2211D 00	22111 00 pt 22112 00 pt 22113 00 pt 22114 10 pt 22114 50 pt 22115 00 pt 22116 00 pt			
20821 03	20821 03	20821 18 20821 19 pt			20925 25	20925 25	20924 25										2211E 00	2211E 00	22111 00 pt 22112 00 pt 22113 00 pt 22114 10 pt 22114 50 pt 22115 00 pt 22116 00 pt
20824 99	20824 99	20824 71 20824 81 20824 91			20925 26	20925 26	20924 26												
20840 45	20840 45	20840 43			20925 31	20925 31	20924 31	2211G 10 2211G 30	2211G 10 2211G 30	22119 00									
20840 46	20840 46				20925 32	20925 32	20924 32				2211H 37	2211H 37	2211A 37						
20851 48	20851 48	20851 41 20851 45 20851 49			20925 33	20925 33	20924 33 pt							2211H 42	2211H 42	2211A 42			
20863 10	20863 10	20861 01 pt 20861 03 pt 20861 07 pt 20861 10 pt 20861 11 pt 20861 12 pt 20861 13 pt 20861 14 pt 20861 15 pt 20861 16 pt			20925 34	20925 34	20924 34										2211H 43	2211H 43	2211H 43
		20861 17 pt 20861 18 pt 20861 19 pt 20861 20 pt 20861 21 pt 20861 22 pt 20861 23 pt 20861 24 pt 20861 25 20861 26 pt			20925 35	20925 35	20924 35												
		20861 27 pt 20861 28 pt 20861 29 pt 20861 31 pt 20861 32 pt 20861 33 pt 20861 34 pt 20861 36 pt 20861 37 pt 20861 38 pt			20925 36	20925 36	20924 36	2211H 46	2211H 46	2211A 46									
		20861 39 pt 20861 42 pt 20861 45 pt 20861 47 pt			20926 11 20926 13 20926 98	20926 11 20926 13 20926 98	20924 98				2211H 62	2211H 62	2211A 62						
					20951 15	20951 15	20915 18 20951 17							2221B 00	2221B 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22217 10 pt 22217 30 pt			
					20961 00	20992 13	20992 12										2221C 00	2221C 00	22214 00 pt 22215 00 pt 22216 00 pt
					20980 21	20981 21	20981 21												
					20980 31	20981 31	20981 31	2221E 00	2221E 00	22224 00 pt 22225 00 pt 22226 00 pt 22227 00 pt 22228 00 pt 22229 00 pt 22230 00 pt									
					20997 13	2099A 13	2099A 11 pt				2221F 00	2221F 00	22231 00 pt 22232 00 pt 22233 00 pt 22234 00 pt 22235 00 pt 22236 00 pt 22237 00 pt						
					20997 21	2099A 21	2099A 21							2221G 00	2221G 00	22238 00 pt 22239 00 pt 22240 00 pt 22241 00 pt 22242 00 pt 22243 00 pt 22244 00 pt			
					20997 31	2099A 31	2099A 31										2221H 00	2221H 00	22245 00 pt 22246 00 pt 22247 00 pt 22248 00 pt 22249 00 pt 22250 00 pt 22251 00 pt
			20997 41	2099A 41	2099A 41	2221I 00	2221I 00												
			20997 61	20341 36	20341 36			2221J 00	2221J 00	22259 00 pt 22260 00 pt 22261 00 pt 22262 00 pt 22263 00 pt 22264 00 pt 22265 00 pt									
			20997 71	20440 19	20440 19						2221K 00	2221K 00	22266 00 pt 22267 00 pt 22268 00 pt 22269 00 pt 22270 00 pt 22271 00 pt 22272 00 pt						
			20997 81	20982 35	20982 35									2221L 00	2221L 00	22273 00 pt 22274 00 pt 22275 00 pt 22276 00 pt 22277 00 pt 22278 00 pt 22279 00 pt			
			20997 85	20982 41	20982 41												2221M 00	2221M 00	22280 00 pt 22281 00 pt 22282 00 pt 22283 00 pt 22284 00 pt 22285 00 pt 22286 00 pt
			20997 98	2099A 98	2099A 98	2221N 00	2221N 00												
20863 20	20863 20	20863 01 20863 03 20863 07 20863 10 20863 12 20863 13 20863 14 20863 15 20863 16 20863 17	20866 09	20866 09	20860 00			2221O 00	2221O 00	22294 00 pt 22295 00 pt 22296 00 pt 22297 00 pt 22298 00 pt 22299 00 pt 22300 00 pt									
		20863 18 20863 19 20863 20 20863 21 20863 22 20863 23 20863 24 20863 26 20863 27 20863 28 20863 29	20873 21	20873 21	20873 13 pt 20873 39 pt						2221P 00	2221P 00	22301 00 pt 22302 00 pt 22303 00 pt 22304 00 pt 22305 00 pt 22306 00 pt 22307 00 pt						
		20863 30 20863 31 20863 32 20863 34	20873 23	20873 23	20873 13 pt 20873 39 pt									2221Q 00	2221Q 00	22308 00 pt 22309 00 pt 22310 00 pt 22311 00 pt 22312 00 pt 22313 00 pt 22314 00 pt			
			20873 25	20873 25	20873 13 pt 20873 39 pt												2221R 00	2221R 00	22315 00 pt 22316 00 pt 22317 00 pt 22318 00 pt 22319 00 pt 22320 00 pt 22321 00 pt
			20873 41	20873 41	20873 13 pt 20873 39 pt	2221S 00	2221S 00												
			20873 43	20873 43	20873 13 pt 20873 39 pt			2221T 00	2221T 00	22329 00 pt 22330 00 pt 22331 00 pt 22332 00 pt 22333 00 pt 22334 00 pt 22335 00 pt									
			20873 45	20873 45	20873 13 pt 20873 39 pt						2221U 00	2221U 00	22336 00 pt 22337 00 pt 22338 00 pt 22339 00 pt 22340 00 pt 22341 00 pt 22342 00 pt						
			20910 19	20324 11 20910 19	20324 98 pt 20910 19									2221V 00	2221V 00	22343 00 pt 22344 00 pt 22345 00 pt 22346 00 pt 22347 00 pt 22348 00 pt 22349 00 pt			
																	2221W 00	2221W 00	22350 00 pt 22351 00 pt 22352 00 pt 22353 00 pt 22354 00 pt 22355 00 pt 22356 00 pt
						2221X 00	2221X 00												
								2221Y 00	2221Y 00	22364 00 pt 22365 00 pt 22366 00 pt 22367 00 pt 22368 00 pt 22369 00 pt 22370 00 pt									
											2221Z 00	2221Z 00	22371 00 pt 22372 00 pt 22373 00 pt 22374 00 pt 22375 00 pt 22376 00 pt 22377 00 pt						
														2222A 00	2222A 00	22378 00 pt 22379 00 pt 22380 00 pt 22381 00 pt 22382 00 pt 22383 00 pt 22384 00 pt			
																	2222B 00	2222B 00	22385 00 pt 22386 00 pt 22387 00 pt 22388 00 pt 22389 00 pt 22390 00 pt 22391 00 pt
						2222C 00	2222C 00												
								2222D 00	2222D 00	22399 00 pt 22400 00 pt 22401 00 pt 22402 00 pt 22403 00 pt 22404 00 pt 22405 00 pt									
											2222E 00	2222E 00	22406 00 pt 22407 00 pt 22408 00 pt 22409 00 pt 22410 00 pt 22411 00 pt 22412 00 pt						
														2222F 00	2222F 00	22413 00 pt 22414 00 pt 22415 00 pt 22416 00 pt 22417 00 pt 22418 00 pt 22419 00 pt			
																	2222G 00	2222G 00	22420 00 pt 22421 00 pt 22422 00 pt 22423 00 pt 22424 00 pt 22425 00 pt 22426 00 pt
						2222H 00	2222H 00												
								2222I 00	2222I 00	22434 00 pt 22435 00 pt 22436 00 pt 22437 00 pt 22438 00 pt 22439 00 pt 22440 00 pt									
											2222J 00	2222J 00	22441 00 pt 22442 00 pt 22443 00 pt 22444 00 pt 22445 00 pt 22446 00 pt 22447 00 pt						
														2222K 00	2222K 00	22448 00 pt 22449 00 pt 22450 00 pt 22451 00 pt 22452 00 pt 22453 00 pt 22454 00 pt			
																	2222L 00	2222L 00	22455 00 pt 22456 00 pt 22457 00 pt 22458 00 pt 22459 00 pt 22460 00 pt 22461 00 pt
						2222M 00	2222M 00												
								2222N 00	2222N 00	22469 00 pt 22470 00 pt 22471 00 pt 22472 00 pt 22473 00 pt 22474 00 pt 22475 00 pt									
											2222O 00	2222O 00	22476 00 pt 22477 00 pt 22478 00 pt 22479 00 pt 22480 00 pt 22481 00 pt 22482 00 pt						
														2222P 00	2222P 00	22483 00 pt 22484 00 pt 22485 00 pt 22486 00 pt 22487 00 pt 22488 00 pt 22489 00 pt			
																	2222Q 00	2222Q 00	22490 00 pt 22491 00 pt 22492 00 pt 22493 00 pt 22494 00 pt 22495 00 pt 22496 00 pt
						2222R 00	2222R 00												
								2222S 00	2222S 00	22504 00 pt 22505 00 pt 22506 00 pt 22507 00 pt 22508 00 pt 22509 00 pt 22510 00 pt									
											2222T 00	2222T 00	22511 00 pt 22512 00 pt 22513 00 pt 22514 00 pt 22515 00 pt 22516 00 pt 22517 00 pt						
														2222U 00	2222U 00	22518 00 pt 22519 00 pt 22520 00 pt 22521 00 pt 22522 00 pt 22523 00 pt 22524 00 pt			
																	2222V 00	2222V 00	22525 00 pt 22526 00 pt 22527 00 pt 22528 00 pt 22529 00 pt 22530 00 pt 22531 00 pt
						2222W 00	2222W 00												
								2222X 00	2222X 00	22539 00 pt 22540 00 pt 22541 00 pt 22542 00 pt 22543 00 pt 22544 00 pt 22545 00 pt									
											2222Y 00	2222Y 00	22546 00 pt 22547 00 pt 22548 00 pt 22549 00 pt 22550 00 pt 22551 00 pt 22552 00 pt						
														2222Z 00	2222Z 00	22553 00 pt 22554 00 pt 22555 00 pt 22556 00 pt 22557 00 pt 22558 00 pt 22559 00 pt			
																	2223A 00	2223A 00	22560 00 pt 22561 00 pt 22562 00 pt 22563 00 pt 22564 00 pt 22565 00 pt 22566 00 pt
						2223B 00	2223B 00												



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2221C 00— Con.	2221C 00— Con.	22214 00 pt —Con. 22217 10 pt 22217 30 pt	22514 37	22512 37	22512 37	22840 51	22840 51	22840 15 pt 22840 28 pt	23531 01	23521 15	23521 15
			22514 39	22512 39	22512 36 22512 38				23531 03	23521 41	23521 41
2221D 00	2221D 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22514 45	22512 45	22512 45	22950 00 22950 98	22950 00 22950 98	22950 00	23531 05	23521 83	23521 83
			22518 14	22517 14	22517 15 pt				23531 09	23521 91	23521 91
			22518 17	22517 17	22517 17	22991 00	22910 00 pt	22910 00 pt	23532 01	23522 12	23522 12
						22991 12 22991 13	22910 12 22910 13	22910 11	23532 03	23522 15	23522 15
			22525 11	22523 11	22523 11				23532 05	23522 17	23522 17
2221E 00	2221E 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22525 15	22512 11	22512 11	22991 15 22991 17	22910 15 22910 17	22910 19	23532 09	23522 98	23522 98
			22525 17	22523 17	22523 17	22991 21 22991 23	22910 21 22910 23	22910 00	23533 01	23510 12	23510 12
			22525 21	22523 21	22523 21				23533 03	23510 41	23510 41
			22525 27	22523 27	22523 27	22991 35	22910 35	22910 36 22910 38	23533 09	23510 93	23510 93
2221F 00	2221F 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22525 31	22523 31	22523 31	22991 47	22910 47	22910 47	23613 00	23613 00	23611 30 pt 23612 00
			22525 51	22523 51	22523 51	22994 22	22940 22	22940 14 pt 22940 21 pt	23614 00	23614 00	23611 30 pt
			22525 57	22523 57	22523 57	22994 31	22940 31	22940 14 pt 22940 21 pt	23615 00	23615 00	23611 10
			22525 61	22523 61	22523 61						
2221H 10	2221H 10	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22525 81	22523 81	22523 81	22994 35	22940 35	22940 14 pt 22940 21 pt	23692 00	23631 00	23631 00
			22526 25	22524 25	22524 25	22994 39	22940 39	22940 14 pt 22940 28	23693 40	23691 40	23691 40
			22526 42	22517 13 22524 41	22517 15 pt 22524 41	22994 41	22940 41	22940 41	23693 70	23693 70	23691 70
			22526 51	22524 51	22524 51	22995 17	22930 17	22930 17	23693 80 23693 93	23691 80 23691 93	23691 92
2221H 20	2221H 20	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22585 00	22920 00	22920 00	22995 19	22930 19	22930 19	23813 00	23813 00	23811 00 pt 23812 00 pt
			22617 00	22617 00	22617 11 22617 31 22617 51 22617 61	22995 32	22930 32	22930 32	23814 00	23814 00	23811 00 pt 23812 00 pt
						22995 33 22995 35	22930 33 22930 35	22930 34	23910 10	23910 10	23910 11 pt 23910 17 pt 23910 18 pt 23910 51 pt 23910 57 pt 23910 58 pt
			22619 00	22619 00	22619 11 22619 31 22619 51 22619 71	22995 57	22930 57	22930 57			
2221J 00	2221J 00	22218 00 22218 15 22218 25 22218 35 22218 38 22218 55 22218 58 22218 64 22218 67	22628 00	22628 00	22628 20 22628 30 22628 50 22628 61	22996 03	22996 03	22992 75	23910 12	23910 12	23910 11 pt
						22996 10	22996 10	22993 40	23910 19 23910 21	23910 19 23910 21	23910 17
			22629 00	22629 00	22629 20 22629 30 22629 50 22629 61	22996 11	22996 11	22993 50	23910 25	23910 25	23910 18 pt
						23213 00	23213 00	23212 00 23214 00 pt	23910 52	23910 52	23910 51 pt
2221K 00	2221K 00	22219 15 22219 25	22731 00	22710 00	22710 00	23216 00	23216 00	23214 00 pt	23910 59 23910 61	23910 59 23910 61	23910 57
2221M 21	2221M 21	2221A 21 2221A 22	22732 20	22720 20	22720 20	23222 00	23215 00	23215 00	23910 62	23910 62	23910 58 pt
2221M 23	2221M 23	2221M 23 2221M 24	22732 40	22720 40	22720 40	23229 11	23229 93	93000 00	23921 11	23921 11	23921 12 pt 23921 13 pt 23921 15 pt 23921 17 pt 23921 18 pt 23921 19 pt 23921 27 pt 23921 28 pt 23921 29 pt
2221M 25	2221M 25	2221A 25 2221A 26	22733 00	22790 00	22790 00	23229 12	23219 15	23219 15			
2221M 27	2221M 27	2221A 27 2221A 28	22815 10	22833 10	22831 00	23251 00	23271 11	23271 00			
2221M 33	2221M 33	2221A 33 2221A 37	22815 20	22833 20	22833 20	23252 00	23283 00	23283 00			
2221M 41	2221M 41	2221A 41 2221A 44	22822 21 22822 31	22822 21 22822 31	22822 00	23259 11	23279 13	23279 00 pt	23921 14	23921 14	23921 12 pt
2221M 42	2221M 42	2221A 42 2221A 45	22823 11	22823 11	22823 27 pt 22823 32 pt 22823 35 pt	23259 12	23289 11	23289 11	23921 16	23921 16	23921 13 pt 23921 15 pt
2221M 43	2221M 43	2221A 43 2221A 46	22823 13	22823 13	22823 27 pt 22823 32 pt 22823 35 pt	23261 00	23281 00	23281 00			
2221M 47	2221M 47	2221A 47 2221A 48				23262 00	23284 00	23284 00	23921 20	23921 20	23921 17 pt
			22823 15	22823 15	22823 27 pt 22823 32 pt 22823 35 pt	23269 00	23289 13	23289 13	23921 21	23921 21	23921 18 pt 23921 19 pt
2221M 71	2221M 71	2221A 71 pt 2221A 72 pt				23299 11	23279 11	23279 00 pt	23921 24	23921 24	23921 23 23921 25
2221M 77	2221M 77	2221A 71 pt 2221A 72 pt	22840 31	22840 31	22840 15 pt	23299 13	23299 93	93000 00	23921 30	23921 30	23921 27 pt
			22840 33	22840 33	22840 28 pt	23313 00	23313 00	25512 00 23317 00 pt	23921 31	23921 31	23921 28 pt 23921 29 pt
22514 17	22512 17	22512 17	22840 41	22840 41	22840 15 pt	23314 00	23314 00	23317 00 pt			
22514 21	22512 21	22512 21	22840 43	22840 43	22840 28 pt	23413 00	23413 00	23413 30 23413 31	23923 10 23923 13	23923 10 23923 13	23923 00



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23924 12	23924 12	23924 11 pt 23924 13 pt 23924 39 pt	24112 28	24112 28	24112 11 24112 15 24112 20 24112 22 24112 27 pt	24363 98	24363 98	24363 01 pt 24363 03 pt	24994 14— Con. 24994 16	24994 14— Con. 24994 16	24994 13 pt —Con. 24994 15 pt
23924 14	23924 14	23924 11 pt 23924 13 pt 23924 39 pt	24113 11 24113 13	24113 11 24113 13	24113 00	24367 00	24367 00	24367 01 24367 03	24994 17	24994 17	24994 17
23924 16	23924 16	23924 11 pt 23924 13 pt 23924 39 pt	24114 08 24114 10	24114 08 24114 10	24114 11	24411 63	24411 63	24411 65 24411 83	24994 23	24994 23	24994 23
23924 33	23924 33	23924 31 pt 23924 39 pt	24114 12 24114 14	24114 12 24114 14	24114 13	24522 17 24522 19	24522 17 24522 19	24522 21	24994 25	24994 25	24994 25
23924 35	23924 35	23924 31 pt 23924 39	24114 16	24114 16	24114 17 pt	24912 01 24912 03 24912 05 24912 07	24912 01 24912 03 24912 05 24912 07	24912 11	24994 41	24994 41	24994 41
23924 36	23924 36		24114 18	24114 18	24114 19 pt	24912 09 24912 12 24912 14 24912 16	24912 09 24912 12 24912 14 24912 16	24912 13	24994 51	24994 51	24994 51
23924 37	23924 37	23924 44 pt 23924 45 pt 23924 47 pt 23924 49 pt	24114 22 24114 24	24114 22 24114 24	24114 17 pt 24114 19 pt	24913 01 24913 03	24913 01 24913 03	24913 11	24994 54	24994 54	24994 53 24994 55
23924 38	23924 38	23924 44 pt 23924 45 pt	24114 29 24114 33 24114 35	24114 29 24114 33 24114 35	24114 31	24913 05 24913 07 24913 09 24913 12 24913 14	24913 05 24913 07 24913 09 24913 12 24913 14	24913 13	24994 57	24994 57	24994 57
23924 40	23924 40	23924 47 pt 23924 49 pt	24211 61 24211 63 24211 65	24211 61 24211 63 24211 65	24211 71	24913 12 24913 14	24913 12 24913 14	24913 11	24994 58	24994 58	24994 59 24994 60
23924 41	23924 41	23924 41 23924 44 pt 23924 45 pt	24211 75 24211 77	24211 75 24211 77	24211 73	24919 01 24919 03 24919 05 24919 07 24919 09	24919 01 24919 03 24919 05 24919 07 24919 09	24919 00	24994 61	24994 61	24994 61
23924 43	23924 43	23924 47 pt 23924 49 pt	24212 31	24212 31	24212 22 pt 24212 23 pt 24212 25 pt	24919 01 24919 03 24919 05 24919 07 24919 09	24919 01 24919 03 24919 05 24919 07 24919 09	24919 00	24994 62	24994 62	24994 62
23924 46	23924 46	23924 44 pt 23924 45 pt	24212 33	24212 33	24212 22 pt	24931 03	24921 03	24920 03	24994 71	24994 71	24994 71
23924 48	23924 48	23924 47 pt 23924 49 pt	24212 35	24212 35	24212 23 pt	24931 05	24921 05	24920 05	24994 75	24994 75	24994 75
23924 50	23924 50	23924 42 23924 44 pt 23924 45 pt	24212 37	24212 37	24212 25 pt	24931 07	24921 07	24920 07	24994 79	24994 79	24994 79
23924 51	23924 51	23924 47 pt 23924 49 pt	24215 16	24215 16	24215 77 pt	24931 09	24921 09	24920 09	24994 85	24994 85	24994 85
23924 54	23924 54	23924 49 pt	24215 18	24215 18	24215 78 pt	24931 12	24921 12	24920 12	24994 89	24994 89	24994 89
23924 55	23924 55	23924 53 pt	24215 22	24215 22	24215 77 pt	24931 14	24921 14	24920 14	24994 91	24994 91	24994 91
23924 56	23924 56	23924 52 pt 23924 53 pt	24215 24	24215 24	24215 78 pt	24931 16	24921 16	24920 16	24994 97	24994 97	24994 97
23924 91	23924 91	23924 83 23924 84	24261 21 24261 23	24261 21 24261 23	24261 19	24931 18	24921 18	24920 18	24994 99	24994 99	24994 13 pt 24994 15 pt 24994 63 24994 64 24994 98
23924 92	23924 92	23924 85	24262 24	24262 24	24262 23 24262 25	24931 19	24921 19	24920 19	25112 91 25112 98	25112 91 25112 98	25112 99
23924 96	23924 96	23924 89	24262 86	24262 86	24262 89	24931 20	24922 00	24920 00	25113 33 25113 35	25113 33 25113 35	25113 31
23930 95	23930 95	23930 93	24266 11 24266 13	24266 11 24266 13	24266 00	24931 18	24921 18	24920 18	25113 91 25113 99	25113 91 25113 99	25113 98
23930 96	23930 96		24290 61	24290 61	24290 63 24290 73	24932 00	24922 00	24920 00	25115 17	25158 00	25158 00
23940 61	23940 61	23940 98	24290 83	24290 83	24290 81 24290 89	24933 14	24993 14	24993 14	25115 91 25115 99	25115 91 25115 99	25115 98
23940 63	23940 63		24312 00	24312 00	24312 75	24933 15	24993 15	24993 15	25116 21 25116 31 25116 98	25116 21 25116 31 25116 98	25116 99
23940 65	23940 65		24312 09	24312 09	24312 11 24312 13	24934 00	24996 00	24996 00 24996 12 24996 13 24996 15 24996 16 24996 17 24996 18 24996 19	25117 43 25117 45 25117 47 25117 49	25117 43 25117 45 25117 47 25117 49	25117 48
23952 00	23951 12 23959 11	23951 12 23959 11 pt	24318 73 24318 77	24318 73 24318 77	24318 75	25117 63 25117 65 25117 67 25117 69	25117 63 25117 65 25117 67 25117 69	25117 61	25120 31 25120 35	25120 31 25120 35	25120 32
23958 11	23959 11	23951 11 pt	24353 11	24353 11	24353 01 pt 24353 03 pt	24935 00	26611 00	26611 00	25145 12 25145 13	25145 12 25145 13	25141 11
23958 33	23959 33	23959 33	24353 31	24353 31	24353 01 pt 24353 03 pt	24936 14	24998 14	24998 14	25145 15	25145 15	25141 15
23964 34	23951 34	23951 34	24353 98	24353 98	24353 01 pt 24353 03 pt	24936 15	24998 15	24998 15	25145 17	25145 17	25141 17
23964 37	23951 37	23951 37	24353 27 24354 31	24353 27 24354 31	24354 29	24936 16	24998 16	24998 16	25145 19	25145 19	25141 98 pt
23990 97	23990 97	23990 98	24363 11	24363 11	24363 01 pt 24363 03 pt	24936 17	24998 17	24998 17	25145 21	25145 21	25142 11
23990 99	23990 97	23990 99	24363 31	24363 31	24363 01 pt 24363 03 pt	24937 21	24995 21	24995 21	25145 27	25145 27	25142 51
24111 09	24111 09	24111 25 pt	24363 11	24363 11	24363 01 pt 24363 03 pt	24937 31	24995 31	24995 31	25145 98	25145 98	25141 98 pt 25142 71
24111 27	24111 27	24111 19 24111 25 pt	24363 11	24363 11	24363 01 pt 24363 03 pt	24994 11	24994 11	24994 11	24994 14	24994 14	24994 13 pt
24112 23	24112 23	24112 27 pt									



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25146 12	25146 12	25143 12	26570 31	26510 31	26510 31	26732 23	26436 23	26436 23	26792 96	26494 96	26494 96
25146 14	25146 14	25143 14	26570 41	26510 41	26510 41	26733 11	26437 11	26437 00	26793 00	26496 00	26496 00
25146 22	25146 22	25143 22	26570 51	26510 51	26510 51	26733 12	26437 12		26794 00	26460 00	26460 11
25146 24	25146 24	25143 24	26570 61	26510 61	26510 61	26733 14	26437 14				26460 19
25146 98	25146 98	25143 98	26570 71	26510 71	26510 71	26741 11	26434 11	26434 11	26795 11	26497 11	26497 11
25147 33	25147 33	25144 33	26570 81	26510 81	26510 81	26741 12	26434 12	26434 12	26795 22	26497 22	26497 21
25147 37	25147 37	25144 37	26570 84	26544 84	26544 10 pt	26741 13	26434 13	26434 13	26795 23	26497 23	
25147 55	25147 55	25144 55	26570 86	26544 86	26544 12	26741 15	26434 15	26434 15	26795 31	26497 31	26497 31
25147 71	25147 71	25144 71	26570 88	26544 88	26544 14	26742 11	26438 11	26438 11	26795 35	26497 35	26497 35
25147 75	25147 75	25144 75	26570 90	26544 90	26544 10 pt	26742 12	26438 12	26438 12	26795 41	26497 41	26497 41
25147 82	25147 82	25144 92	26570 95	26510 95	26510 95	26751 00	26453 00	26453 00	26795 45	26497 45	26497 45
25147 83	25147 83	25144 93	26570 96	26510 96	26510 97 pt	26752 61	26454 61	26454 61	26795 48	26497 48	26497 48
25147 85	25147 85	25144 94	26570 99	26510 99		26752 71	26454 71	26454 71	26795 51	26497 51	26497 51
25147 87	25147 87		26711 00	26415 00	26415 00	26752 97	26454 97	26454 97	26795 55	26497 55	26497 55
25147 91	25147 91	25144 97 pt	26711 11	26415 11	26415 15	26753 00	26455 00	26455 00	26795 61	26497 61	26497 61
25147 99	25147 99	25144 91	26711 15	26415 15		26761 14	26471 14	26471 14	26795 69	26497 69	26497 69
		25144 97 pt	26712 11	26416 11	26416 11	26761 51	26471 51	26471 51	27213 24	27213 24	27213 21 pt
25152 65	25152 65	25152 67	26712 12	26416 12	26416 12	26763 00	26473 00	26473 00	27213 28	27213 28	27213 29 pt
		25152 69	26713 13	26419 13	26419 11				27213 30	27213 30	
25190 23	25190 23	25190 41	26713 14	26419 14		26763 88	26473 88	26473 88	27213 32	27213 32	27213 21 pt
25190 25	25190 25		26713 18	26419 18	26419 12	26764 11	26474 11	26474 11			27213 23
25190 33	25190 33	25190 32	26713 21	26419 21		26764 25	26474 25	26474 25			27213 29 pt
25190 35	25190 35		26714 11	2641A 11	2641A 11	26764 27	26474 27	26474 27	27213 34	27213 34	27213 31 pt
25312 13	25312 13	25312 11	26714 12	2641A 12	2641A 12	26764 33	26474 33	26474 33	27213 38	27213 38	27213 39 pt
25312 15	25312 15		26714 13	2641A 13	2641A 13	26764 35	26474 35	26474 35	27213 40	27213 40	
25312 33	25312 33	25312 31	26714 14	2641A 14	2641A 14	26764 37	26474 37	26474 37	27213 42	27213 42	27213 31 pt
25312 35	25312 35		26714 15	2641A 15	2641A 15	26764 41	26474 41	26474 41			27213 33
25312 43	25312 43	25312 41	26714 16	2641A 16	2641A 16	26764 43	26474 43	26474 43	27213 44	27213 44	27213 39 pt
25312 45	25312 45		26721 13	26411 13	26411 13	26764 45	26474 45	26474 45	27213 46	27213 46	27213 41 pt
25312 47	25312 47		26721 33	26411 33	26411 53	26764 47	26474 47	26474 47	27213 48	27213 48	27213 45 pt
25425 00	25993 13	25990 97 pt	26722 00	26413 00	26413 00	26764 55	26474 55	26474 55	27214 24	27214 24	27214 21 pt
25991 00	25991 00	25990 21	26723 00	26414 00	26414 00	26764 71	26474 71	26474 71	27214 28	27214 28	27214 29 pt
25992 31	25992 31	25990 41	26724 45	2641B 45	2641B 45	26764 76	26474 76	26474 76	27214 32	27214 32	27214 21 pt
25992 33	25992 33		26724 51	2641B 51	2641B 51	26764 77	26474 77	26474 77	27214 23	27214 23	27214 29 pt
25992 35	25992 35	25990 45	26724 53	2641B 53	2641B 53	26764 79	26474 79	26474 79	27214 34	27214 34	27214 31 pt
25992 37	25992 37		26724 55	2641B 55	2641B 98 pt	26764 81	26474 81	26474 81	27214 38	27214 38	27214 39 pt
25992 47	25992 47	25990 47	26724 56	2641B 56		26764 83	26474 83	26474 83	27214 40	27214 40	
25992 48	25992 48	25990 48	26724 59	2641B 59	2641B 11	26764 99	26474 99	26474 85	27214 42	27214 42	27214 31 pt
25994 51	25993 51	25990 51	26724 21	2641B 21	2641B 98 pt	26770 00	26420 00	26420 00	27214 33	27214 33	27214 39 pt
25994 97	25993 97	25990 97 pt	26731 00	26435 00	26435 00	26770 00	26420 00	26420 00	27214 44	27214 44	27214 41 pt
2621B 00	26612 00	26612 00	26732 11	26436 11	26436 11	26781 00	26481 00	26481 00	27214 46	27214 46	27214 45 pt
26530 14	26530 14	26530 29	26732 12	26436 12	26436 12	26782 00	26482 00	26482 00	2721A 70	2721A 70	2721A 30 pt
26530 30	26530 30		26732 13	26436 13	26436 13	26791 21	26493 21	26493 21	2721A 40	2721A 40	2721A 40 pt
26561 00	26541 00	26541 00	26732 14	26436 14	26436 14	26791 23	26493 23	26493 23	2721A 80	2721A 80	2721A 30 pt
26562 33	26542 33	26542 33	26732 15	26436 15	26436 15	26791 26	26493 26	26493 25	2721A 90	2721A 90	2721A 40 pt
26562 35	26542 35	26542 35	26732 16	26436 16	26436 16	26791 28	26493 28		2721B 70	2721B 70	2721B 30 pt
26563 10	26545 10	26545 10	26732 17	26436 17	26436 17	26791 32	26493 32	26493 31	2721B 40	2721B 40	2721B 40 pt
26563 12	26545 12	26545 12	26732 18	26436 18	26436 18	26791 33	26493 33		2721B 80	2721B 80	2721B 30 pt
26563 14	26545 14	26545 14	26732 21	26436 21	26436 21	26791 35	26493 35		2721B 90	2721B 90	2721B 40 pt
26563 16	26545 16	26545 16				26792 82	26494 82	26494 82	2721C 70	2721C 70	2721C 30 pt
26570 14	26510 14	26510 14				26792 91	26494 91	26494 91			2721C 40 pt
26570 15	26510 15	26510 97 pt									
26570 21	26510 21	26510 21									



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2721C 80	2721C 80	2721C 30 pt	27592 21	2751B 21	27512 11 pt 27512 15 pt 27512 16 pt 27512 18 pt 27512 23 pt	27598 21	2751H 21	27519 25	28230 39	28230 39	28230 33 pt 28230 37 pt
2721C 90	2721C 90	2721C 40 pt				27598 23	2751H 23	27519 29	28241 13	28241 13	28241 14 pt 28241 16 pt
2731E 57	2731E 57	2731E 43 2731E 55	27592 23	2751B 23	27512 33 pt	27598 25	2751H 25	27519 11	28241 19	28241 19	28241 14 pt
27416 00	27416 00	27411 13	27592 27	2751B 27	27512 41 pt 27512 43 pt	27598 27	2751H 27	27519 81	28241 21	28241 21	28241 14 pt
27417 13	27417 13	27411 15				27598 29	2751H 29	27519 85	28241 23	28241 23	28241 16 pt
27417 15 27417 17	27417 15 27417 17	27411 21	27593 12	2751C 12	27513 11	27598 31	2751H 31	27519 98	28241 25	28241 25	28241 14 pt 28241 16 pt
27418 13	27418 13	27412 13	27593 18	2751C 18	27513 17 27513 19	27599 12	27531 12	27531 12	28244 32	28244 32	28244 31 pt 28244 33 pt
27418 15	27418 15	27412 15	27594 11	2751D 11	27514 11	27599 22	27531 22	27531 22	28244 34 28244 36	28244 34 28244 36	28244 31 pt
27419 00	27419 00	27414 00	27594 13	2751D 13	27514 13	27599 32	27531 32	27531 32	28244 38	28244 38	28244 33 pt
2741A 00	2741A 00	27415 21	27594 15	2751D 15	27514 19	2759A 00	2751J 00	27510 00 pt	28244 41	28244 41	28244 31 pt 28244 33 pt
2741B 13	2741B 13	27415 11	27594 17	2751D 17	27514 25	27823 00	27823 00	27823 00 27823 43 27823 45	28244 43	28244 43	28244 35
2741B 14	2741B 14	27415 31	27594 19	2751D 19	27514 27	27892 81 27892 92	27892 81 27892 92	27892 91	28244 45	28244 45	28244 37
2741B 15	2741B 15	27415 41	27595 12	2751E 12	27515 11	27910 16 27910 18	27910 16 27910 18	27910 12 27910 14	28247 13	28247 13	28243 31 pt 28245 61 pt 28245 73 pt
2741B 17	2741B 17	27415 61	27595 14	2751E 14	27515 23	27961 13	27951 13	27951 13 35557 77 pt	28247 15	28247 15	28243 31 pt 28245 61 pt 28245 73 pt
2741B 19	2741B 19	27415 65	27595 16	2751E 16	27515 25	27961 15	27951 15	27951 15 35557 77 pt	28247 16	28247 16	28243 31 pt 28245 63 pt 28245 72 pt
2741B 21	2741B 21	27415 95	27595 18	2751E 18	27515 31	27961 17	27951 17	27951 17 35557 77 pt	28247 19	28247 19	28243 31 pt 28245 61 pt 28245 63 pt 28245 72 pt 28245 73 pt
2741B 23	2741B 23	27415 97	27595 20	2751E 20	27515 33	27961 23	27951 23	27951 23 35557 77 pt	28247 31	28247 31	28243 33 pt
2741B 25 2741B 27	2741B 25 2741B 27	27415 99 pt	27595 22	2751E 22	27515 41	27961 29	27951 29	27951 29 35557 77 pt	28247 33	28247 33	28243 33 pt 28245 66 28245 74
2741B 91	2741B 91	27415 51 27415 99 pt	27595 24	2751E 24	27515 98	27962 31	27952 31	27952 31	28247 41	28247 41	28243 39 28245 69 28245 79
27522 15	27522 15	27522 11 pt 27522 13 pt	27596 11	2751F 11	27516 13	27963 15	27532 15	27532 15	28248 15	28248 15	28246 15
27522 16	27522 16	27522 23 pt	27596 13	2751F 13	27516 41	27963 25	27532 25	27532 25	28248 51	28248 51	28246 51
27522 18	27522 18	27522 23 pt	27596 15	2751F 15	27516 51	27963 35	27532 35	27532 35	28248 81	28248 81	28246 31 28246 62 28246 71
27522 23 pt	27522 23 pt	27522 23 pt	27596 17	2751F 17	27516 71	27963 45 27963 47	27532 45 27532 47	27532 65 pt	28333 24 28333 26	28333 24 28333 26	28333 25
27522 27 pt	27522 27 pt	27522 27 pt	27596 19	2751F 19	27516 75	27963 53	27547 00	27547 00	28351 10	2831A 21	2831A 21
27522 33 pt	27522 33 pt	27522 33 pt	27596 21	2751F 21	27516 45	27963 61	27930 15	27930 15	28351 15	2831A 22	2831A 22
27522 37 pt	27522 37 pt	27522 37 pt	27596 23	2751F 23	27516 93	27963 63	27930 17	27930 17	28351 20	2831A 24	2831A 24
27522 41 pt	27522 41 pt	27522 41 pt	27596 25	2751F 25	27516 95	27963 65	27930 21	27930 13 27930 19	28351 25	2831A 25	2831A 25
27522 45 pt	27522 45 pt	27522 45 pt	27596 27	2751F 27	27517 11	27963 71	27532 71	27532 65 pt	28351 30	2831A 26	2831A 26
27522 49 pt	27522 49 pt	27522 49 pt	27597 12	2751G 12	27511 00	27963 72 27963 73	27532 72 27532 73	27532 75	28351 35	2831A 41	2831A 27 2831A 28
27522 53 pt	27522 53 pt	27522 53 pt	27597 14	2751G 14	27512 13 pt	28161 11 28161 21	28161 11 28161 21	28161 00	28351 40 28351 45	2831A 42 2831A 30	2831A 29
27522 57 pt	27522 57 pt	27522 57 pt	27597 16	2751G 16	27512 17 pt	28162 30 28162 40 28162 50 28162 60	28162 30 28162 40 28162 50 28162 60	28162 98	28352 10	2831A 31	2831A 31
27522 61 pt	27522 61 pt	27522 61 pt	27597 18 27597 20	2751G 18 2751G 20	27512 19 pt	28230 34	28230 34	28230 33 pt 28230 37 pt	28352 15	2831A 51	2831A 32 2831A 33
27522 65 pt	27522 65 pt	27522 65 pt	27597 22	2751G 22	27512 13 pt 27512 17 pt 27512 19 pt	28230 38	28230 38	28230 33 pt 28230 37 pt	28352 20	2831A 61	2831A 35 2831A 36 2831A 37
27522 69 pt	27522 69 pt	27522 69 pt	27597 24	2751G 24	27512 31				28352 25	2831A 39	2831A 39
27522 73 pt	27522 73 pt	27522 73 pt	27597 26	2751G 26	27512 33 pt						
27522 77 pt	27522 77 pt	27522 77 pt	27597 28	2751G 28	27512 41 pt						
27522 81 pt	27522 81 pt	27522 81 pt	27597 30	2751G 30	27512 43 pt						
27522 85 pt	27522 85 pt	27522 85 pt	27597 32	2751G 32	27514 00						
27522 89 pt	27522 89 pt	27522 89 pt	27597 34	2751G 34	27515 00						
27522 93 pt	27522 93 pt	27522 93 pt	27597 36 27597 38	2751G 36 2751G 38	27516 00						
27522 97 pt	27522 97 pt	27522 97 pt	27598 11 27598 13	2751H 11 2751H 13	27519 17 pt						
27522 101 pt	27522 101 pt	27522 101 pt	27598 15 27598 17	2751H 15 2751H 17	27519 15 27519 17 pt						
27522 105 pt	27522 105 pt	27522 105 pt	27598 19	2751H 19	27519 23						



[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product codes were revised for 1987. Listed below are the revisions to the product codes. The terms published and collected are defined as follows: (1) published refers to the code used in the published reports for 1987 and 1982, and (2) collected refers to the code appearing on the report forms for 1987]

1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
28361 15	28311 15	28311 15	28511 00— Con.	28511 00— Con.	28511 11— Con. 28511 85 28511 89 28511 93	28750 20	28750 20	28750 11 pt 28750 21 pt	29521 13— Con. 29521 15	29521 13— Con. 29521 15	29521 11— Con.
28361 20	28311 20	28311 13 28311 17 28311 19				28750 30	28750 30	28750 31 pt			
28362 10	28312 10	28312 00	28512 00	28512 00	28512 21 28512 23 28512 25 28512 27 28512 31 28512 33 28512 35 28512 37 28512 39 28512 41	28750 40	28750 40	28750 11 pt 28750 21 pt	29523 62	29523 62	29523 53
28362 20	28312 20					28750 50	28750 50	28750 31 pt	29523 64	29523 64	29523 54 pt 29523 56 pt
28363 10	28313 10	28317 15				28750 60	28750 60	28750 11 pt 28750 21 pt	29523 66	29523 66	29523 54 pt 29523 56 pt
28363 20	28313 20	28317 25				28750 70	28750 70	28750 31 pt	29990 20 29990 30	2911D 20 2911D 30	2911D 92
28364 10	28314 10	28318 14				28797 51	28797 51	28797 31 28797 81	29990 93 29990 99	29990 93 29990 99	29990 98
28364 15	28314 15								28914 57 28914 98	28914 57 28914 98	28914 89
28364 20	28314 20	28318 16				28916 10	28916 10	28915 56 pt	31116 37 31116 38	31116 37 31116 38	31116 72 pt
28364 25	28314 25								28916 20	28916 20	28915 61 pt
28364 30	28314 30	28319 00				28916 30	28916 30	28915 63 pt	31116 51	31116 51	31116 53 31116 72 pt
28411 43	28411 43	28411 42 28411 44				28916 40	28916 40	28915 65 pt	31116 57	31116 57	31116 55 31116 72 pt
28411 62	28411 62	28411 61 28411 63				28916 50	28916 50	28915 67 pt	31116 62	31116 62	31116 61 31116 72 pt
28412 18	28412 18	28412 05 28412 19	28515 00	28515 00	28515 21 28515 22 28515 23 28515 31 28515 32 28515 99	28917 11	28917 11	28915 54	31116 63 31116 65	31116 63 31116 65	31116 64 31116 72 pt
28413 97	28413 97	28413 51 28413 61 28413 95				28917 21	28917 21	28915 55			
28423 53	28423 53	28423 99	28611 98	28611 98	28611 13 28611 23 28611 99	28917 31	28917 31	28915 56 pt	31440 00	31440 00	31445 00 31446 00 31447 00 31448 00
28423 95	28423 95					28917 41	28917 41	28915 61 pt			
28441 49	28441 49	28441 37 28441 39	28612 31	28612 31	28612 11 28612 21	28917 51	28917 51	28915 63 pt	31490 20	31490 20	31491 00 31493 00 31495 00 31496 00 31497 25
28443 25	28443 25	28443 98				28917 61	28917 61	28915 65 pt			
28443 27	28443 27		28656 58	2911C 58	2911C 58	28917 71	28917 71	28915 67 pt	31610 01	31610 01	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
28443 95	28443 95					28920 39	28920 39	28920 35 28920 37			
28444 71	28444 71	28444 73 28444 75	28691 32	2911B 32	2911B 32	28920 57	28920 57	28920 53 28920 55	31610 05	31610 05	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
28445 02	28445 02	28445 11				28995 25 28995 26	28995 25 28995 26	28995 29			
28445 03	28445 03	28445 12	28695 25 28695 27	28695 25 28695 27	28695 21	28995 40 28995 42 28995 45	28995 40 28995 42 28995 45	28995 37	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
28445 04	28445 04	28445 13				28995 69 28995 70 28995 71	28995 69 28995 70 28995 71	28995 68			
28445 05	28445 05	28445 14	28742 00	28742 00	28742 00 28742 10 28742 71	28995 82 28995 83 28995 84	28995 82 28995 83 28995 84	28995 81	31610 07	31610 07	31610 24 31610 32
28445 08	28445 08	28445 15				28995 94 28995 96	28995 94 28995 96	28995 95			
28445 09	28445 09		28744 10	28744 10	28744 21 pt 28744 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
28445 50	28445 50	28445 45 28445 48				28995 94 28995 96	28995 94 28995 96	28995 95			
28445 59	28445 59	28445 95	28744 20	28744 20	28744 11 pt 28744 21 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
28511 00	28511 00	28511 11 28511 21 28511 22 28511 24 28511 25 28511 35 28511 37 28511 38 28511 43 28511 45				28995 94 28995 96	28995 94 28995 96	28995 95			
		28511 47 28511 49 28511 53 28511 57 28511 59 28511 63 28511 65 28511 69 28511 71 28511 73 28511 75 28511 77 28511 81 28511 83	28744 30	28744 30	28744 31 pt	28995 94 28995 96	28995 94 28995 96	28995 95	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28744 40	28744 40	28744 11 pt 28744 21 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28744 50	28744 50	28744 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28744 60	28744 60	28744 11 pt 28744 21 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28744 70	28744 70	28744 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	28750 21 pt 28750 31 pt	28995 98 28995 99	28995 98 28995 99	28995 97	31610 09	31610 09	31610 16 pt 31610 18 pt 31610 35 pt 31610 37 pt 31610 39 pt
						28995 98 28995 99	28995 98 28995 99	28995 97			
			28750 10	28750 10	2875						





# PUBLICATION PROGRAM

## 1987 CENSUS OF MANUFACTURES

Publications of the 1987 Census of Manufactures, containing preliminary and final data on manufacturing establishments in the United States, are described below. Publications order forms for the specific reports may be obtained from any Department of Commerce district office or from Data User Services Division, Customer Services (Publications), Bureau of the Census, Washington, DC 20233.

### Preliminary Reports

#### Industry series—83 reports (MC87-I-20A(P) to -39D(P))

Preliminary industry data are issued in 83 separate reports covering 459 industries. Preliminary summary data for the U.S. and States are released in one report.

### Final Reports

#### Industry series—83 reports (MC87-I-20A to -39D)

Each of the 83 reports provides information for a group of related industries ("dairy products" includes industries for butter, cheese, milk, etc.). Final figures for the United States are shown for each of the 459 manufacturing industries on quantity and value of products shipped and materials consumed, cost of fuels and electric energy, capital expenditures, assets, rents, inventories, employment, payroll, payroll supplements, hours worked, value added by manufacture, number of establishments, and number of companies. Comparative statistics for earlier years are provided where available.

For each industry, data on value of shipments, value added by manufacture, capital expenditures, employment, and payroll are shown by employment-size class of establishment, State, and degree of primary product specialization.

#### Geographic area series—51 reports (MC87-A-1 to -51)

A separate report is being published for each State and the District of Columbia. Each report presents data for industry groups and industries on value of shipments, cost of materials, value added by manufacture, employment, payroll, hours worked, new capital expenditures, and number of manufacturing establishments for the State, MSA's, counties, and selected places. Comparative statistics for earlier census years are shown for the State and large MSA's. Manufacturing totals are presented for each county and for places with significant manufacturing activity. Detailed statistics (including inventories, assets, rents, and energy costs) are presented only in statewide totals.

#### Subject series—7 reports (MC87-S-1 to -7)

Each of the seven reports contains detailed statistics for an individual subject, such as concentration ratios in manufacturing, type of organization, water use in manufacturing, textile machinery in place, distribution of sales by class of customer, manufacturers' shipments to the Federal Government, and a general national-level summary.

#### Reference series—1 report (MC87-R-1)

The Numerical List of Manufactured and Mineral Products includes a description of the principal products and services published in the 1987 Censuses of Manufactures and Mineral Industries.

#### Location of Manufacturing Plants—1 report (MC87-LM)

This report includes data for number of establishments by four-digit SIC industry and by employment-size class for counties, incorporated places of 2,500 inhabitants or more, and zip codes for each State. (This report is available only on magnetic tape and CD-ROM.)

#### Analytical Reports—3 reports (AR87-1 to -3)

##### Exports From Manufacturing Establishments (AR87-1)

This report presents data on exports by two- and three-digit SIC industry groups for the United States and States. Information is presented on value of direct report shipments and estimates of the employment required to manufacture these products. Included are estimates of employment in manufacturing and nonmanufacturing establishments that supply parts, materials, and services for production of manufactured exports.

##### Selected Characteristics of Manufacturing Establishments That Export (AR87-2)

This report presents data on the number of manufacturing companies and establishments that export by major group, State, employment size, and ratios of exports to shipments.

##### Indexes of Production (AR87-3)

The indexes presented in this report are designed to measure the change in physical output of each manufacturing and mineral industry between 1982 and 1987.

### MICROFICHE

Every final published report in the 1987 Census of Manufactures will be available on microfiche.

### PUBLIC-USE COMPUTER TAPES AND COMPACT DISCS

Data from the final industry series, geographic area series, and the Location of Manufacturing Plants report will be available on public-use computer tapes and compact discs-read only memory (CD-ROM). These tapes will provide the same information found in the final reports. Computerized data products are available for users who wish to summarize, rearrange, or process large amounts of data. These products, with corresponding technical documentation, are sold by Data User Services Division, Customer Services (Tapes), Bureau of the Census, Washington, DC 20233.

### OTHER ECONOMIC CENSUSES REPORTS

Data on retail trade, wholesale trade, service industries, construction industries, mineral industries, transportation, enterprise statistics, minority-owned businesses, and women-owned businesses also are available from the 1987 Economic Censuses. A separate series of reports covers the censuses of outlying areas—Puerto Rico, Virgin Islands of the United States, Guam, and the Northern Mariana Islands. Separate announcements describing these reports are available free of charge from Data User Services Division, Customer Services (Publications), Bureau of the Census, Washington, DC 20233.















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